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## IN THIS ISSUE:

- 4** Ruggedness and Reliability – A Journey Beyond the Datasheet
- 7** Slovenia's electronic components market
- 10** Automotive and Mobility Forum: Southern and Eastern Europe 2022 provided a look into the future of the industry
- 12** Greece's mining industry
- 16** Steel manufacturing in Turkey
- 20** 9<sup>th</sup> edition of Supply Chain & Logistics Expo to be held in October 2023
- 20** Preparations underway for MAKTEK Eurasia 2022
- 22** WorldFood Istanbul to be held for the 30<sup>th</sup> time
- 22** Eco Wave 2022 to showcase latest technologies for the green economy
- 23** EBRD's Green Cities Programme helps Sarajevo on its way to sustainability

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# -IoT success stories in 2022

**Zoltan Kiss, Export Manager - Head of R&D - Endrich Bauelemente Vertriebs GmbH**

In this paper we are a little out of the habit and instead of presenting technical details, we want to talk a little bit about the success of Endrich's development team in recent weeks and months at domestic and international exhibitions and forums. The 2020 debut of the E-IoT concept at the EmbeddedWorld 2020 exhibition in Nuremberg has already predicted that the engineering community in the field of IoT will welcome the introduction of a complete test infrastructure to support their work in terms of components, turnkey solutions and software services. This has been detailed in a number of white papers in SEEIM magazine as well. Based on this experience, the management of Endrich GmbH has opened the way for the establishment of the Budapest Competence Center and the further development of the concept, which will enable product development in the near future at a conventional distribution company operating originally on the field of electronics components. At the Hungexpo Industry Days exhibition, which was held in October 2020 being the first to allow physical appearance after the pandemic, Endrich „won“ grand prizes in two categories. Of course, the developments then continued with steam power, and we also wanted to scale ourselves internationally.

The first international competition we took part was the AMA Innovation Award competition related to the Sensor + Test 2022 exhibition. The E-IoT concept - although being not among the four winning entries - was mentioned in the top thirty innovations to be included in this year's catalog.

([https://www.ama-sensorik.de/fileadmin/Innovation-spreis/2022/Broschuere\\_20220502\\_eng.pdf](https://www.ama-sensorik.de/fileadmin/Innovation-spreis/2022/Broschuere_20220502_eng.pdf)).



At the same time, we took part in several 2022 spring competitions, of which the Yettel IoT LiveShow and the Hungexpo Industry Days exhibition stood out in Hungary. In the first event, based on the audience votes, we were not far behind the winning entry, but the second event brought us a very valuable result. As the concept has already won the 2020 Exhibition Grand Prix, this year we competed with one of the special applications that builds on the E-IoT concept, but puts it in a real industrial environment, using it to support preventive maintenance. One of the next issues of the magazine,

we will report in detail about the telemetry unit for intelligent UV-C air purification equipment developed with our sister company, euroLighting GmbH. This device and the surrounding hardware and software infrastructure were chosen by us as this year's entry. To our great delight, the competition („SMART-IoT-Kit“ unit and „Smart“ air purifier, which complements traditional equipment with remote monitoring and telemetry functions) won the Grand Prix of 2022 and Industry Days, Mastech and Automotive Expo. Together with Mr. Wolfgang Endrich, our founding owner and CEO of euroLighting GmbH, we have been handed out the trophy by Dr. Laszlo Gyorgy, State Secretary for Economic Strategy and Regulation of the Ministry of Innovation and Technology, at the opening ceremony in May this year.



And even then, this dream series did not end, as in the meantime the E-IoT concept received a valuable nomination in the annual German Innovation Award competition organized by the German Design Council. The nomination itself is a recognition we were proud of, as the jury is made up of professionals who come across more valuable developments every day at the head of the innovation centers of the leading companies in the field. This year's awards were juried by Dr Elias Knubben, Vice President of Research and Innovation at Festo, Christina Wang, Managing Director of Lufthansa's Innovation Hub, Michael Kruzaa, Development Manager at Deutsche Telekom and many other renowned German experts. To our great pleasure, the family of products and services born in Endrich's Budapest office, dreamed up, designed and continuously developed by Hungarian engineers, won the German Innovation Award 2022 in the Excellence in Business to Business, at category Connectivity ( <https://www.german-innovation-award.de/en/winners/preis/gewinner/endrich-iot-plattform-hardware-software-toolkit> ). It was a pleasure for me to receive the prize - together with Dr Christiane Endrich, CEO of the Endrich Bauelemente Vertriebs GmbH - at the May 24 gala in Berlin at the Futurium Museum.

Of course, the awards themselves - although we are extremely proud of them - are merely of sentimental and marketing value, but in the same time utilizing the concept can bring real success. We work hard to reach this every day in both area I manage, in international sales we look for channels where real (IoT related) product needs to be developed, and with the staff of the Budapest development center we try to figure out in advance

the directions where we can expect further success. Another such area is the extension of the E-IoT concept with a local wireless MESH sensor network, where the E-IoT single-board computer serves as a Gateway to the IP World for lithium-battery-powered intelligent sensors operating in the 868 MHz ISM band. Of course, here too we use NarrowBand and LTE-M technologies to help bring data to the cloud. This new concept has been unveiled for the first time at the EmbeddedWorld 2022 exhibition in Nuremberg, where Endrich aims to promote the E-IoT concept almost entirely, focusing on our new slogan „Making your device SMARTI!“. This new product line is to be further extended and expected to be shown at the SIDO exhibitions in Lyon and Paris in the autumn, in Bulgaria at the International Fair in Plovdiv and at the Electronica 2022 exhibition in Munich.

And last but not least, I would like to thank my colleagues Csaba Kocsis and Zsolt Veresegyhazy for backing me up on this joyful but bumpy road and achieving these successes together.

**endrich**  
components of life

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# Ruggedness and Reliability – A Journey Beyond the Datasheet

**Xuning Zhang, Tomas Krecek and Nitesh Sathesh**  
Microchip Technology

Transportation touches lives every day, moving people and goods from points A to B. An interruption in such a system would have a cascading effect. Trains especially are subject to a variety of weather systems that may influence the electronics used within. It is therefore important for transportation system developers to consider parameters that are not typically presented in datasheets. This is even more important in the case of wide band-gap power electronics such as Silicon Carbide (SiC), which is a novel material in such an application.

Microchip Technology's SiC power devices are rugged, robust and apt for demanding applications within the transportation segment. A strong portfolio of standard, custom packaging options provide customers with flexibility in design. Digital programmable gate drivers, available as printed circuit board (PCB) plug-and-play or core drivers, provide engineers with tools to optimize system performance and tune the system to the application with minimal hardware modifications.

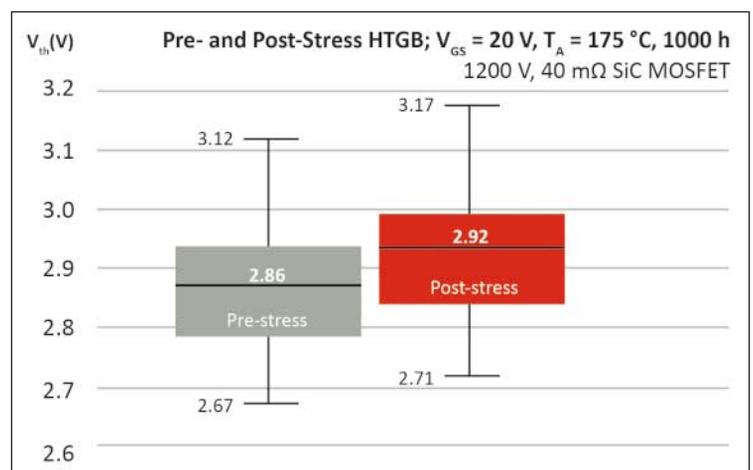
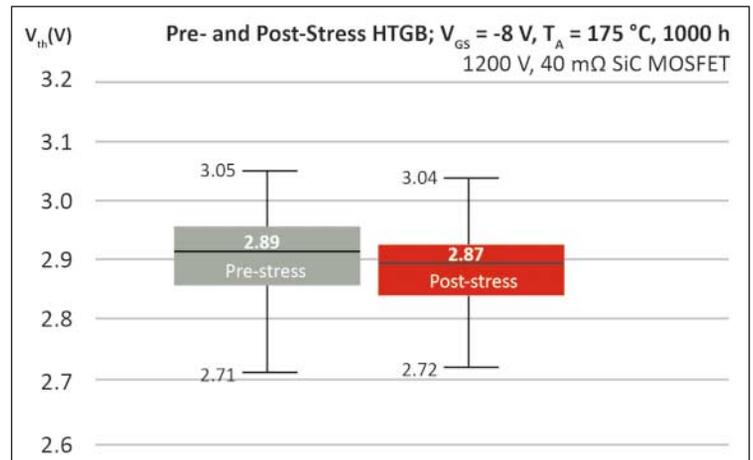
The toughness of SiC MOSFETs across wide-ranging conditions is essential for auxiliary power units (APUs) that power both conventional and emergency loads. The following must be verified:

- 1) the stability and lifetime of the MOSFET's gate oxide;
- 2) the stability of the MOSFET's body diode; and
- 3) failure toughness measures such as avalanche ruggedness.

## Stability and Lifetime of MOSFET Gate Oxide

To ensure the stable operation of the power converter, the power devices must have minimum threshold voltage shift and reliable device performance throughout the converter lifetime. Figure 1 shows how  $V_{th}$  data for production-grade SiC MOSFETs should exhibit no meaningful change after 1000 h of stress at 175°C.

The gate oxide lifetime can be predicted by accelerating samples to failure using elevated temperature and electric field. A production-grade SiC



**Figure 1. Threshold voltage of production-grade SiC MOSFETs before and after (up); negative and positive high-temperature gate bias stress (down).**

MOSFET gate oxide can last well beyond 100 years at high stress, ensuring confidence in routine, reliable APU operation beyond the designed service lifetime.





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Utilize the comprehensive set of documentation and certified software libraries to simplify and accelerate your system development while saving certification cost and time.

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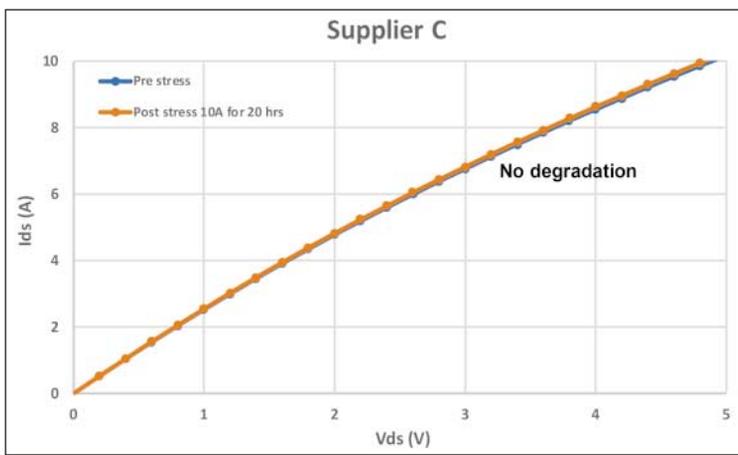
- TÜV Rheinland certified diagnostic libraries can be used to implement an SIL 2 safety level in single-channel applications and an SIL 3 safety level in dual-channel applications
- Detects random hardware failures in the core, Flash memory, SRAM and other peripherals
- The SIL 2/3 diagnostic libraries are part of an overall safety package that includes a software safety manual as well as a safety checklist offering for the IEC 61508 industrial safety designs
- Complete source code for PIC® and AVR® MCUs and dsPIC33C DSCs, and binaries for PIC32C and SAM 32-bit MCUs



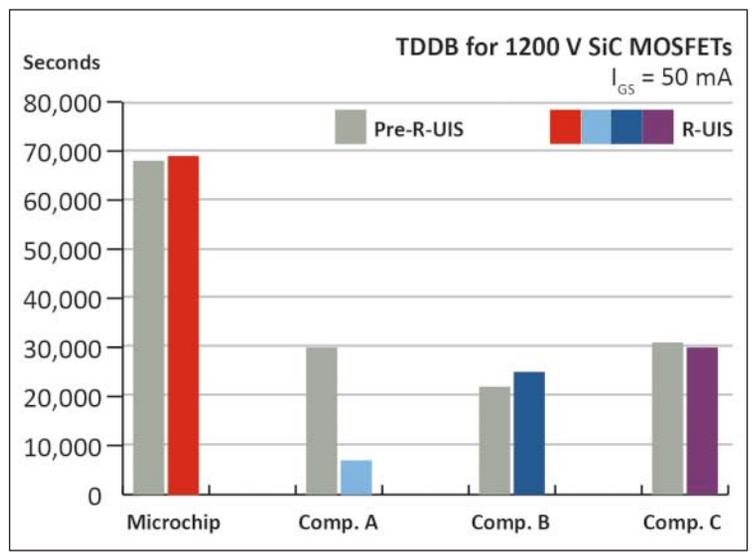
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**Figure 2. Pre- and post-stress  $R_{DSon}$  for Microchip SiC MOSFETs (left). Time-dependent dielectric breakdown (right), before and after repetitive avalanche failure for commercially available SiC MOSFETs from four suppliers.**



## Body Diode Stability

A SiC MOSFET can conduct reverse current using its intrinsic body diode. Compared to an Insulated Gate Bipolar Transistor (IGBT) solution, using a SiC MOSFET with stable body diode enhances reliability and cuts cost by eliminating the antiparallel diode. However, the body diode reliability varies greatly across different suppliers. In some devices, this diode degrades over time, leading to an increased  $R_{DSon}$  and more heat than designed. Figure 2 (left) shows body diode I-V curves and MOSFET ON-state drain-source resistance ( $R_{DSon}$ ) after many hours of constant forward current stress. Microchip devices under test shows no perceptible shift.

## Avalanche Ruggedness

Transportation APUs are susceptible to a variety of fault conditions, demanding SiC MOSFETs designed to safely and reliably perform through these events, and to maintain consistent performance before and after faults. Avalanche ruggedness is one of the key demands. The cause of avalanche of a power device can be very often unclamped induction switching. The load current is suddenly dumped into the MOSFET, forcing the drain-source voltage to rise to breakdown. Unlike short circuit, the MOS channels are not enhanced; avalanche current crowds the die edge, rapidly taking the device to its thermal limitations. Avalanche phenomenon is serious for power semiconductors due to possible lifetime degradation due to the electrical and overheat stressing. Repetitive unclamped inductive switching (R-UIS) is used to evaluate a de-

vice's avalanche ruggedness. Figure 2 (right) shows time-dependent dielectric breakdown (TDDB) for commercial SiC MOSFETs before and after 100 000 cycles of R-UIS. Many suppliers maintain oxide strength but the ability of Microchip SiC MOSFETs with up to four times the toughness alongside stability in  $R_{DSon}$  and drain-source leakage reinforces the SiC MOSFETs' ability to safely ride through the most demanding electric overstress conditions.

## Smart/Intelligent Gate Drivers Demand

As a gate driver represents an interface (very often galvanically isolated) between high and low voltage sides and, in addition, reliable gate control, monitoring and many other safety features, under any condition and/or circumstances it is one of the most important sub-systems from performance and reliability points of view. Under normal operational conditions the gate driver follows commands from the host controller to turn-on/off a power semiconductor. The converters require gate drivers with adjustable dead time, like that the gate driver provides enough time (dead time) to recover blocking capability of the device being turn-off. The voltage is applied to the gate to turn-on the power semiconductor switch affects the  $R_{DSon}$  and hence is another important parameter to minimize conduction losses.

Finally, gate resistors define the switching transients speed and hence the time taken for the power semiconductor to turn-on or off. Designers often optimize these parameters according to various requirements. Reliability also means protecting the converter from faults,



**Figure 3. Gate driver core mounted on adapter board (up) and Microchip power module representing available eval kit. Screenshot (down) showing Intelligent Configuration Tool available for gate driver boards programming.**

which can be, in the worst case, destructive. Simply, many parameters and features can be assigned to gate drives that suggest the question, can we have reliable drivers which can be configurable by software like on Figure 3 (right) instead of hardware? Microchip's family of digital programmable gate drivers, like the one captured in Figure 3 (left), provide designers with full flexibility in adjusting the parameters per their application, load profile or other specific requirements. In addition, they offer fault feedback, which can be useful in fault diagnosis. On top of that, Microchip's digital gate driver family provides basic DC link voltage and temperature measurement. Short circuit in power converters can become destructive if not properly managed. Protection through Microchip's patented augmented switching limits fault current by detecting the fault sooner and limits overvoltage by managing the turn-off through a multi-step gate driving voltage.

SiC provides innumerable benefits in rail traction. Microchip's SiC goes well beyond the datasheet in fulfilling demanding application requirements for rail traction.



# Slovenia's electronic components market

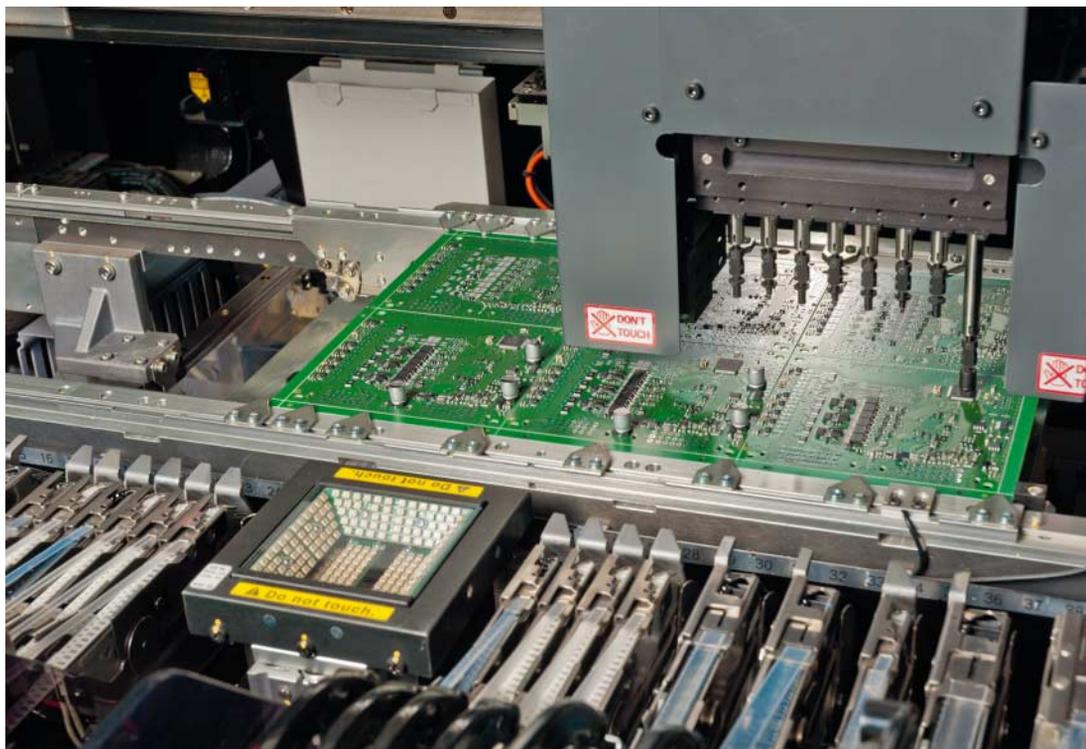
Slovenia has a geostrategic location, business-stimulating regulations and political stability. These factors make it an excellent ecosystem for business development and growth. This Alpine country also offers dynamic and interesting innovation perspectives as the number of researchers has more than doubled since the year 2000. Investors are aware of Slovenia's advantages in R&D. Some of the world's largest companies have formed key global competence centers for products and technologies in Slovenia. And according to a regular annual survey among German investors in central and Eastern Europe, Slovenia is the most attractive location for research and development investments in the region.

## Electronics – fastest growing industry in the country

Two of the prime characteristics of Slovenian electronics industry are fast growth and high value-added. In fact, the industry is the fastest growing manufacturing branch in Slovenia. Between 2015 and 2019 the electrical and electronics industry increased its exports by a massive 43,7 percent. Founded on a strong tradition, this sector is turning into one of the key drivers towards a greener and digital future, providing essential components for e-mobility, smart grids, smart homes, and cities.

According to data provided by Spirit Slovenia Business Development Agency the sector is one of the strongest in Slovenian manufacturing with close to EUR 5 billion of annual turnover and around 30 000 employees. This was made possible by a high standard of quality, strong R&D, and constant innovation integrated into its processes. The vast majority of the sales are generated by companies in the manufacturing of home appliances, electrical motors, transformers, and equipment for power grids, batteries, cables, pumps, heating and cooling equipment, and various mechatronic components.

Slovenian electronics companies are mostly highly specialized SMEs with leading products in their respective niches in the production of circuit boards, electronic components, optronic and laser devices, telecommunication systems, and measurement equipment. Though the electronics manufacturers annually generate less than EUR 850 million, they create over EUR 300 million of value-added – that is around 37 percent – this being one of the highest percentages in Europe, on par with Swiss and German electronics industries.



Advantages of Slovenian electronics production include educated and highly skilled workforce, high operating efficiency, continuing investment in research and development, ability to identify market niches, development and engineering electronics components, integration in local and global supply chains.

## Export markets of electronics components

According to data by Statistical Office of the Republic of Slovenia (SORS), dated May 2022, the largest export market in electronics is Serbia (28%), followed by Belgium (14%), Croatia (10%), Philippines (9%) and Germany (7%).

The true rise of the industry started after World War II, with the formation of two large companies, home appliances producer Gorenje and electronics component manufacturer Iskra.

Gorenje is now a part of the Chinese Hisense group and remains one of the largest companies in Slovenia. It is not only the Chinese that rely on Slovenian tradition and know-how. Bosch Siemens has located one of its excellence centers for small home appliances in Slovenia. Many of the popular products of this large manufacturing group were designed in Slovenia.

Home appliances remain one of the most successful sub branches of the industry with over EUR 2 billion of annual sales and a strong local network of suppliers. Some of these suppliers are global leaders in their niche, such as produc-

ers of electrical motors for vacuum cleaners for example.

Apart from home appliances, the Slovenian electrical industry focuses on a few select areas. In some of these fields, Slovenian companies enjoy very competitive positions or are even niche leaders. A large share of Slovenian companies is focusing on the needs of the automotive industry. They supply their automotive partners with lighting systems, cables, coils, sensors, antennas for keyless start systems, electronic and mechatronic components, Li-ion batteries, and electrical motors.

## Strong niche development in electronics

The electronics industry in Slovenia might be small and yet is a powerful player in clearly defined niches like optotronics, laser technology, medical instruments, and measurement devices. One of the key niches is also the design and manufacturing of printed circuits for highly specialized applications. Slovenian-designed boards are for example used in CERN's Large Hadron Collider. In fact, there is hardly a major particle accelerator in the world that does not use Slovenian developed measurement devices. Small series and innovative electronic products from Slovenia include, among others, advanced medical and dentistry laser systems, sensors for industrial and medical applications, LED optotronic devices, and lab equipment. The industry enjoys strong support from local research and academic



mation and control systems for heating and cooling are interwoven with data collection and analysis. In short, the Slovenian electrical and electronics industry has proactively responded to the challenges of the future; providing solutions that are integrated, digital, and – above all – friendlier to the planet.

Printed circuits seem to be one of the key niches for Slovenia's electronics industry. Among the most advanced developers or producers of PCBs are Ergoline, Intec TIV, Evoteh, Hyb and Proplace. Hyb also develops pressure sensors for industrial use (hybysens) and medical technology. Its hybymed program includes innovative, invasive blood measurement equipment and wireless, closed blood sampling systems. Together with partners Hyb also developed Freehand, an innovative medical device based on an electromotive arm intended for laparoscopic, minimal invasive surgery procedures. Another two companies, which also exhibited at the last edition of electronica, are Etra TT and Sumer. Etra TT manufactures transformers. Sumer is a family business supplying the electronics and home appliance industries with metal and plastic components.

Intec TIV is another manufacturer that excels in state-of-the-art product development. In the year of 2000 the company Ergoline merged with the company Intec TIV Ltd. from Kranj. This move was very beneficial and successful for both companies since they managed to cooperate in

institutions. And over 5 percent of its turnover is reinvested into its own R&D: a share well above the EU average.

Mechatronic components, custom-made electrical motors, and a vast array of sensors are key elements in some of the megatrends like IoT, smart homes and cities, factories 4.0, and e-mobility. And in the development and production of these elements, Slovenian electrical and electronics companies excel. Many already provide

both components for smart solutions or engineer entire systems like factory 4.0 production lines. Slovenian-made automatic guided vehicles used in smart logistics centers use locally developed electronic components and solutions. The developers of vehicle tracking systems are preparing solutions for autonomous driving. The locally developed machine vision solutions are indispensable in smart factories. Several companies are active in the field of smart buildings, where auto-

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development ever since.

Slovenian companies tend to keep close cooperation with institutes and universities in research and development of new technologies. The PCBs produced in Slovenia find application in medicine – high-energy photons for early cancer detection; energy – bipolar plate for electrical to chemical energy conversion – hydrogen in electrolytic cell and bipolar plate for reversible process converting chemical energy of hydrogen to electrical energy. Slovenian PCBs are also used in artificial intelligence for development of intelligent electronics for everyday home use in many devices that enable personal security, energy savings, simplicity and adjustability. Special services are provided for the elderly and people with disabilities as well. Their innovative products are also implemented in Linear accelerator in CERN, which uses electrical and magnetic field for the stimulation of electrically charged atomic and subatomic particles for high speed and collision with others.

## Innovation leading the way to success

Undoubtedly, with 541 companies earning EUR 3,8 billion in sales in 2017, and with 28 000 employees, the electrotechnical and electronics industry is amongst Slovenia's key sectors. Most of its revenue, over EUR 3 billion, is made outside the country. Above all, the companies in this industry belong to the most innovative and successful businesses in the country. For example Ergoline, a company from Cerknica and regular exhibitor at electronica, is an important European developer of flexible and fixed printed circuit boards. It specializes in the boutique production of small series and prototypes, and closely cooperates with Slovenia's leading scientific institution, the Jozef Stefan Institute. Ergoline's solutions are built into CERN's legendary Large Hal-

dron Collider. Slovenia's biggest manufacturer of printed circuit boards (PCBs) is Intec TIV from Kranj. This company, with revenue of around EUR 10 million is owned by Ergoline. Another example of solution providers for the labs which break the frontiers of today's physics also exhibited in Munich: Instrumentation Technology from Solkan near Nova Gorica develops beam stabilization instruments for particle acceleration.

Slovenia's electronics industry has always been well presented at leading innovation shows and trade fairs. For example electronica in Munich, Germany, the world's leading trade fair for electronic components, systems and applications was a host to a number of companies in the printed circuit board development segment as well as manufacturers and companies developing components for the world's top particle accelerators. This year 14 Slovenian companies will present their latest solutions at the world's leading trade fair and conference for electronics – electronica.

Despite its size, Slovenia is the third EU country in the field of ecoinnovations, and has doubled its investment in sustainable development. Its socially responsible economy is among the best in the world in terms of environmental health and ecosystem vitality. Slovenia is a leading Central European country in patent registration and the 30th most innovative country globally. Slovenian companies' R&D investment ranks high above EU-27 average, resulting in technologically advanced products and solutions best suited to the needs of the future.

This is part of the Slovenian strategy to ensure that its solutions are globally competitive. Slovenia also exports sustainable and innovative solutions for the European automotive industry. And moreover, the country was placed 5th by OECD for smart products delivered daily by the Slovenian digital and robot-intensive economy.







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**Neomontana Electronics** is a Bulgarian company located in Sofia, with over 15 years of experience in the development and production of electronic devices. The **NetControl** series of Ethernet network controllers numbers over 10 models and is a result of our many years of experience with Internet Service Provider (ISP) customers from Bulgaria. The products are widely used in the fields of automation (home and building), security systems, data collection and analysis, etc.

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NetControl 6R8A



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**NEOMONTANA ELECTRONICS**, 1715 Sofia, Mladost-4, bl. 483, Tel.: +35928818014, +359888849016, E-mail: office@ipnetcontrol.net

# SEE NEWS

## Monbat and ABC target commercialization of bipolar lead batteries



Advanced Battery Concepts (ABC) and Bulgaria's Monbat agreed on a product development program for the design of a commercial bipolar battery, based on ABC's patented GreenSeal technology, for mass scale production at a future Monbat manufacturing 1 GWh facility to be built in Bulgaria. Forecast for the investment is about EUR 16 million. In the first stage of the program, ABC will produce, in its expanded Clare, MI plant, the so-called Alpha Samples of Block B batteries. Block B is a 48-volt, 32 amp-hour industrial battery, aimed at telecom and battery energy storage systems (BESS) applications. The batteries will be delivered to existing Monbat clients and special projects requiring BESS, for on-site deployment, thus supplying the necessary data for the future mass-scale production. Monbat has intensively tested prototype Block B batteries since 2019, in the company's certified testing laboratories.

Bipolar batteries will offer significant advantages in the industrial battery sector, improving performance, durability, and cost of production/acquisition and at the same time reducing lead and weight, while remaining fully recyclable.

## Mastel CNC to build EUR 5 mln factory in Bihac



Mastel CNC, the Bosnian subsidiary of German metal processing company Mastel CNC-Technik, is investing EUR 5 million in the construction of a factory in Bihac, the city council announced. The factory will spread across 7000 sq m of closed space and additional 20 000 sq m of outdoor area, Bihac mayor Shuhret Fazlic said in a press release. The construction of the plant is expected to be completed by the beginning of summer 2023. The factory will open 50 new job positions, doubling Mastel CNC's current headcount in the country, Sandi Terzic, director of the company, said in the press release.

Mastel Aluminium was founded in 1985 in Talheim, located just outside Heilbronn. The founder is Dietmar Mastel, the owner and managing shareholder. Since then, Mastel fulfils an important service function concerning the aluminium supply of the metal processing industry. Mastel CNC operates in Bosnia since 2019.

# Automotive and Mobility Forum: Southern and Eastern Europe 2022 provided a look into the future of the industry

The international conference Automotive & Mobility Forum: Southern and Eastern Europe 2022, organized by Automotive Cluster Bulgaria, was held between 1 and 3 June in Sofia. During the first day, participants, including a representative of the editorial team of South-East European Industrial Market, had the opportunity to visit some of the facilities of suppliers specializing in automotive electronics – Visteon Electronics Bulgaria, Sensata Technologies Bulgaria and Melix Bulgaria. At its technology center, Visteon demonstrated automated testing of sensor displays with MATT – a robot designed to physically interact with devices through replicating human input, developed by Adapta Robotics. With a fast-moving effector, MATT interacts with the device through 3 capacitive fingers, made to accommodate any materials and capacitive requirements. Tapping, pinching, swiping, rotating, and pressing buttons located on the front or side of device, MATT executes any multi-touch gestures. Using computer vision to recognize icons and text fields MATT performs fully automated test cycles, relieving manual testers of repetitive tasks and increasing productivity. In Visteon's laboratory, forum participants had a look at the new semi-anechoic chamber for measuring radiated emissions and immunity, as well as state-of-the-art equipment for ESD, mechanical and thermal testing of products. Sensata also impressed the visitors with its high-tech prototype testing equipment in its laboratory in Sofia, spread out on a total area of over 14 000 square meters.

The main part of the conference, hosted by Inter Expo Center, started on 2 June with welcoming speeches from the President of the Republic of Bulgaria Rumen Radev, the Minister of Innovation and Growth Daniel Lorer and the CEO of Automotive Cluster Bulgaria arch. Lubomir Stanislavov. In his address to the participants, arch. Stanislavov stressed that despite the difficulties to prove the necessity for the automotive industry in Bulgaria, today it is clear that it definitely has ground in the country and has a platform for development. He pointed out that over the past 10 years the number of companies in the sector in Bulgaria has increased from 30 to over 350, and the turnover has risen from EUR 0,5 to 6,5 billion. „The automotive industry is among those that are the most innovative and bring the greatest added



value. Our country can become a center of innovation for the sector, especially for electric vehicles,” said Minister Lorer, adding that recently the government has been actively working on 7 new potential projects in the industry with an approximate value of over BGN 2 billion, which are expected to create over 4 thousand new jobs. „The quality of the production in Bulgaria is the reason why representatives of leading automotive companies from all over the world invest here. The automotive sector is the fastest growing industry in Bulgaria and accounts for 10 – 12% of the country's GDP, with this share expected to reach about 20% in 5 years. The automotive sector creates 70 thousand jobs in the country, and 9 out of 10 cars manufactured in Europe have built-in components produced in Bulgaria. In addition, 80% of the automotive sensors for vehicles sold in Europe are manufactured in facilities based in Bulgaria,” President Rumen Radev stressed in his speech.

The event continued with extremely interesting panels, which included representatives of the Volkswagen Group's automotive software division – CARIAD, Automotive Cluster Bulgaria, Melix, Visteon, Sensata, Veolia, Bosch Engineering Center Sofia, Next.e.Go, etc. The discussions focused on the transformation of the automotive industry in Southern and Eastern Europe, innovation trends and technologies for a new automotive era, automotive software solutions and the digitalization of manufacturing pro-

cesses in the sector. There was also a special panel dedicated to start-ups as a driving force for innovation and growth, as well as a session focused on the possibilities for improving the level of sustainability in the automotive industry. The day ended with a series of short, organized B2B meetings, hosted by OEMs and suppliers.

The final day of the conference, 3 June, began with a session focused on the supply chain and logistics trends in the SEE automotive sector. It was followed by a regulatory roundtable on the present and future of the Bulgarian car fleet. The discussion was organized in partnership with the Association of Car Manufacturers. After a presentation of the current state of the mobility and fleet process management, topics were centered on the creation of mobility policy for a sustainable car fleet. Among the discussed opportunities for achieving this were: the electrification and digitalization of fleet management; creating a car register containing information about each newly registered car for the period of its operation; digitization of the processes related to the use and servicing of vehicles in Bulgaria; state support for renewal and decarbonization of the fleet; creating an environmental fund to stimulate the renewal of the fleet; possible change in the annual car tax according to the environmental impact of vehicles; development and construction of the charging infrastructure for electric cars in big cities and on the national road network. The event ended with the official opening of Sofia Motor Show 2022.

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# Greece's mining industry

Greece possesses substantial mineral wealth, consisting of a variety of minerals and ores with a large industrial interest. The high quality and the many specialized uses of minerals available in Greece, provide significant comparative advantages to the country's economy. The mining industry (with the exception of aggregates) has strong outward-looking features, since exports account for more than 65% of sales, and for some minerals Greece holds a leading position in the global market. The mining and extractive metallurgy sector has been traditionally one of the most important and dynamic segments of the Greek industry. Today, mining companies are well organized and hold significant market shares in products such as bauxite, alumina, aluminium, nickel, caustic calcined magnesia, dead burned magnesia, raw magnesite, pumice, silica and ornamental stones (primarily marble). Greece is a major global supplier of several key industrial minerals, notably bentonite, magnesite, and perlite. The country's position as a leading producer of these minerals is well

established. Greece is the only country producing huntite, the leading global supplier of perlite, the second in the production of pumice and bentonite, and the first in the export of magnesium compounds within the EU.

Greece was also the second largest producer in the EU, and the fifth largest worldwide, of lignite (brown coal). The mines in the West Macedonia Lignite Centre supplied twenty one power plants with an installed capacity of 5287 MW, which corresponded to 50% of the total installed capacity of the country. Lignite exploitation is still based on the continuous method of excavation – transportation – deposition. The mining procedure of a lignite deposit includes extraction, transportation and deposition of materials (lignite and co-excavated waste materials). The co-excavated waste materials are transported and put back mainly in the excavation voids in an effort to minimize the impact on the landscape.

Moreover, Greece has significant deposits of clay, limestone, slate, gypsum, kaolin, mixed sulphide ores (lead, zinc), olivine, pozzolan, quartz

etc. Finally, there are significant mineral deposits which have not yet been exploited, or where exploitation has temporarily ceased (such as manganese, chromite, uranium, gold, oil, emery, salt etc.), as well as major geothermal energy potential, suitable either for power generation or for various thermal applications. The annual land uptake by mines, quarries and waste dump sites is estimated at 1984 ha/y. The Greek mining/metallurgical industry constitutes an important sector of the country's economic activity (it constitutes 3 – 5% of the GDP, with the inclusion of interrelated enterprises such as quarrying, processing and production of intermediate and final products) and supplies essential raw materials for primary industries such as cement, production of energy, non-ferrous metals (aluminium, nickel, etc.), the industry of stainless steel etc. Estimated sales of the country's mineral industry and basic metallurgies, totals almost EUR 2,5 billion. Moreover, the industry provides a major source of employment in the country: approximately 20 – 23 thousand employees are



employed in the sector and more than 90 thousand are employed in jobs dependent upon or associated with mining. Furthermore, since – as a rule – the processing of these raw materials takes place in the region in which they are excavated, the industry contributes considerably to coveted regional growth.

## Exports

A characteristic of the domestic mining industry is its openness, which is not limited to the high share of exports in sales. The internationalisation of the mining industry is also revealed by the fact that some domestic enterprises are subsidiaries of multinational corporations, while others have joint ventures, mining activities and export trade networks in many foreign destinations. The sales in the global markets take up a significant share of the turnover of the companies in the mining industry. The value of exports reached EUR 1,1 billion in 2013, exceeding 50% of the total turnover in the sector. The export orientation is particularly strong in products, such as marbles, industrial minerals and metals, where the export value has exceeded 70% of the turnover. At the product level, each of the three products with the largest share of exports (cement, aluminium and nickel) take up about 1/5 of the total value of exports. Marbles and alumina come next with about 10% each while the magnesium products (refractories, dead-burned magnesia and caustic calcined magnesia) also have a significant share in exports. The export orientation of the domestic mining industry draws on its significant competitive advantages, particularly with relation to the easy access to ports and thus to water transport (due to the extensive coastline of Greece), but also from the pivotal geographical position of the country. However, there is still a significant lack of basic infrastructure (mainly in terms of rail transport). The upgrade of the rail links between the production facilities of the mining industry on one hand and the domestic ports, but also the industry centres in Central and Eastern Europe, on the other, is anticipated to contribute significantly to further internationalisation and stronger presence of the sector on the global trade map.

## Environmental impact

Taking into account that most of the mining activities in Greece concern aggregates, industrial minerals, energy minerals and metallic minerals without sulphurous elements, the main environmental issue that the mining industry faces concerns the rehabilitation of the natural environment after the end of the deposit exploitation period. The list of current and past rehabilitation projects in Greece includes the creation of woodlands, ponds, wetlands, arable land, museums and places for cultural events and entertainment. About 65 620 acres have been restored since the entry in force of Law No. 998/1979, with the share of restored land over totally utilised plots varying in the range of 35 – 40%. The mining and processing of mixed sulphide ores and the burning of lignite for electricity generation create additional environmental challenges. In this regard, the environmental impact study for the exploitation of the mixed sulphide metallic minerals in northeast Chalkidiki envisages the application of best available techniques for the management of acid mine drainage and the establishment of a programme that would monitor the characteristics of the groundwater in the broader area of the installations. Regarding the use of lignite in electricity generation, a programme for replacement, upgrade and modernisation of the fleet of lignite power plants is under implementation. As part of the plan, six old lignite plans have already been withdrawn, while other two plants have stopped operating since 2014 due to malfunctioning after a fire and are expected to be scrapped. As the development of mining activities brings about significant changes in the local ecosystems, a significant number of domestic mining enterprises apply integrated environmental management systems and make extensive efforts to improve their environmental performance, both as an obligation to comply with the legislation and as part of their corporate

social responsibility programmes. Nevertheless, despite the actions of many mining enterprises, the degree of distrust in the compliance with the environmental regulations and generally in the proper functioning of the institutions remains high in Greece. The ineffective state control mechanisms further erode the level of social trust.

## Coal mining

The first mining of lignite in Greece began in Aliveri (Euboea) in 1873, but its intensive exploitation, in order to cover energy needs, took place only after 1950. All kinds of coal (turf – lignite – sub-bituminous coal) that can be found in Greece are of Cenozoic age and have been deposited in inland or coastal basins. 84% of the lignite-bearing basins are of Neogenic age, 9% of Quaternary age and 7% of Eocene/Oligocene age. The most important basins are the ones of the area of Ptolemaida (Ptolemaida, Komnina, Aghios Christoforos, Perdika), which are of Pliocene age, of Megalopoli and Drama (Pleistocene age) and of Florina (Miocene age). Lignite can be distinguished in peaty lignite (25% of the deposits of Greece), lignite (64%) and sub-bituminous lignite (11%). Sub-bituminous coal, of Eocene/Oligocene age, can be found in Alexandroupolis, Kozani, Grevena; its quality is very good, but has a minor economic importance. The turf deposit in Philippi, with reserves of  $4,3 \times 10^9$  tonnes, is of Pleistocene age.

The total reserves of Greece in lignite are estimated to approximately  $10 \times 10^9$  tonnes, of which the measured reserves are  $6,8 \times 10^9$  tonnes, indicated reserves are  $0,31 \times 10^9$  tonnes, inferred reserves are  $1,95 \times 10^9$  tonnes, and hypothetical reserves are  $0,86 \times 10^9$  tonnes. Of the  $6,8 \times 10^9$  measured reserves,  $3,26 \times 10^9$  tonnes can be found in Ptolemaida,  $0,4 \times 10^9$  tons in Megalopoli,  $1,55 \times 10^9$  tonnes in Drama,  $1,15 \times 10^9$  tons in Ellassona and  $0,47 \times 10^9$  tons in Florina. The exploitation is opencast, and the main exploitation basins are the ones of Ptolemaida and Amyndaio (annual production of 43,6 million tonnes) and Megalopoli (8,9 million tonnes).



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## Bulgartransgaz signs grant agreement for co-financing of the UGS Chiren expansion project



Photo: Bulgartransgaz

Bulgartransgaz and the European Climate, Infrastructure and Environment Executive Agency (CINEA) have signed Grant Agreement for co-financing of the UGS Chiren Expansion Project. The signing of the agreement was marked at an official ceremony in Luxembourg on 27 June within the framework of the EU Council "Transport, Telecommunications and Energy". The Executive Director of Bulgartransgaz Vladimir Malinov received the agreement from the European Commissioner for Energy Ms Kadri Simson.

In 2021, the European Commission included the Chiren UGS expansion in the 5th list of projects of common European interest, and on 27 January 2022 it announced that an agreement had been reached among Member States on funding the project under the Connecting Europe Facility (CEF).

According to the grant agreement for the implementation of the project, co-financing of up to about EUR 78 million is granted under CEF. The project aims to increase the natural gas storage capacity to up to 1 bcm and the daily withdrawal and injection capacities to up to 8 – 10 mcm/d.

## Gerresheimer to invest EUR 126 mln in factory in North Macedonia



German drug packaging and drug delivery systems manufacturer Gerresheimer will invest over EUR 126 million in the construction of a factory for medical glass products and syringes in North Macedonia's capital Skopje, the government of North Macedonia announced. Construction of the facility is scheduled to start in the third quarter of 2022, with a view to launching operations in 2024. The new plant is expected to create more than 180 jobs. In April 2021, Gerresheimer opened a plant for plastic systems for the pharma industry in Skopje. The company has invested more than EUR 60 million in the factory so far, the government in Skopje informed.

Gerresheimer is a leading global partner to the pharmaceutical and healthcare industries. The company has production facilities in 36 locations in Europe, North and South America and Asia, employing nearly 10 000 people and generating revenues of approximately EUR 1,4 billion.



The lower calorific value (LCV) of lignites that can be found in Greece ranges from 840 kcal/kg (Ioannina) to 7000 kcal/kg (Kotyli, in the prefecture of Xanthi). In most cases the LCV ranges from 1800 to 2600 kcal/kg for the Miocene age lignites, 1000 – 1800 kcal/kg, for the Pliocene age ones and <1000 kcal/kg for the Pleistocene age lignites. Lignites with an LCV >2600 kcal/kg are quite few (<0,4% of the reserves). In the wider area of Ptolemaida the calorific value ranges from 1400 kcal/kg to 2300 kcal/kg, while in Megalopoli it amounts to 950 kcal/kg.

The highest moisture content can be found in the lignites of Megalopoli (approximately 62%), Ioannina (61%) and Ptolemaida (60%), while the lowest one can be found in the sub-bituminous coal of Alexandroupolis (8,9%).

In general, the more the age of lignite increases, the more its calorific value and its volatile compounds content increase, and, on the contrary, the more its moisture content decreases. The peat content of lignites varies, even in the same deposit, given the fact that it depends on the percentage of argillitic-marly-psammitic sediments the examined sample contains. However, the value usually ranges between 15 – 20%.

The use of lignite in the production of electricity resulted in the saving of high amounts of foreign exchange (approximately USD 1 billion per year). Lignite was a strategic fuel, since it has a very low mining cost, a stable and directly controllable price, and it can offer stability and safety in the fuel supply. At the same time, it created thousands of jobs in the Greek provinces, particularly in areas that have a high unemployment percentage.

In April 2022 Greek Prime Minister Kyriakos Mitsotakis announced that the country will ramp up coal mining in the next two years as a „tem-

porary“ measure to help reduce a dependence on gas that has soared since last year and after Russia's invasion of Ukraine. „Certainly for the next two years, it would make sense increasing coal-fired energy generation by ramping up its mining by 50% so that we cut reliance from gas in the short-term,“ Mitsotakis said at the inauguration of a solar park in northern Greece.

Once the country's main indigenous energy source, coal now accounts for a small part of power generation under Greece's plan to fully wean off the fuel by 2028. The country, which covers about 40% of its annual energy needs with Russian gas, has been looking into boosting spare coal-fired capacity at Public Power Corp (PPC), its biggest power utility, and adding a floating tank at its sole LNG terminal off Athens to secure energy supplies.

According to a PPC official cited by Reuters the plan is to extract 10 million tonnes of lignite in 2022, and this will be increased to 15 million tonnes. PPC had planned to shut down all but one of its coal-fired plants by 2023 and switch a new, more efficient coal-fired unit due to open later this year to a cleaner fuel by 2025. Signaling a shift in this plan, Mitsotakis said the new plant in northern Greece will probably use coal for longer, until 2028, while the lifetime for other, older plants might also be extended, depending on gas prices and availability.

Apart from lignite, Greece has a large deposit of turf in the region of Philippi (Eastern Macedonia). The exploitable reserves in this deposit are estimated to 4 billion cubic meters and are equivalent to approximately 125 million tonnes of oil.

## Marble

The Greek marbles are among the most famous ones in the world. Apart from the existing

deposits and varieties, they have been fully associated with the masterpieces of sculpture and architecture of ancient Greece. Demand for Greek marble has always been important and the sector is strongly export-oriented, and thus Greece is ranked among the major producers and exporters of marble at a global level.

In the last years the national annual production of marble products has exceeded 1 400 000 tonnes. The exports that take place mainly regard marble blocks with a total value that exceeds EUR 90 000 000.

Today, 75 – 80% of the total production of marble products, with a value of EUR 226 million, is exported. Of the exported products, more than 30 – 35% is exported to China and the rest is exported to the Middle East, to the USA, and, to a lesser degree, to the European market. The reserves of marble deposits in Greece are huge, and there are many that consider them as practically inexhaustible. There is a great variety of marbles in various colorations and types, but there are mainly white marbles, some of which are among the best in the world. It is for this that Greece is considered as the country with the widest variety of white and light coloured marbles.

The principal modern quarries in Greece, can be found in the rich in marble regions of Drama, Kavala-Thasos (Eastern Macedonia), which is the most important quarry centre of the country, of Kozani-Veria, Ioannina, Volos, Dionysos-Penteli, Livadia-Helicon, as well as in other regions (Argolida, Euboea, Skyros, Naxos, Paros, Tinos, etc.)

The exploitation of marbles takes place, principally, in the form of opencast exploitation, in which marbles are cut off with the use of steel wire ropes or special equipment, with the eventual production of the rectangular marble blocks.



Underground exploitations exist today in Greece only in the area of Dionysos in Attica.

### Bauxite

The bauxite deposits in Greece are of karst type. The largest deposits of bauxite in Greece can be found in the area of Parnassus-Ghiona. The colour of bauxites depends on their composition and particularly on the presence of iron oxides or hydroxides. There are: red or brown-red bauxites (with the presence of hematite); yellow bauxites (with the presence of goethite); grey bauxites with a small percentage of iron oxides; white bauxites (with the absence of iron oxides).

Their  $Al_2O_3$  content ranges between 49 – 65%, the  $Fe_2O_3$  content between 18 – 24%, the CaO content between 0 – 5%, the  $SiO_2$  content between 2 – 10%, the  $TiO_2$  content between 0,5

– 3%, and their Cr and Hi content can amount up to 2000 ppm.

Bauxite constitutes the only raw material for the production of alumina and aluminium and is particularly important for Greece. Bauxite can be also used in cement plants, in the production of cast iron as a flux and as a component of rock-wool and of abrasive materials. Greece holds a very important place, not only in the EU, but also at a global level, as it is one of the major bauxite producing countries. 90% of the mining of bauxite in the country takes place in underground exploitations and 10% in opencast ones. The measured amounts of bauxite in Greece amount to approximately 130 million tonnes and the annual production is over 2 million tonnes. The corporations S&B Industrial Minerals S.A., Delphi-Distomon Mining S.A. and ELMIN S.A. are active in the field of bauxite exploitation.

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# Steel manufacturing in Turkey

Steel manufacturing is a traditional industry in Turkey. Today the country is among the main producers of steel and steel products in the world and a major exporter. According to reports by the Turkish Steel Exporters' Association, currently there are 26 electric arc furnace, 11 induction furnace and 3 basic oxygen furnace steel plants in Turkey.

The steel manufactured in local factories is a vital source material both for the country's and the global economy. Together with Turkish iron, steel is globally recognized as a high-quality metal with good prices.

The latest reports by the Turkish Steel Exporters' Association show that worldwide steel production in 2021 increased by 3,7% compared to 2020, reaching 1,95 billion tons. Turkey's steel production registered even more distinctive growth in 2021 – by 12,7%, reaching 40,4 million tons.

„All steel businesses operating in Turkey are private enterprises that regularly monitor technical changes in order to strengthen the country's industry's long-term position in the global market. The steel industry, one of our country's most developed industries, is now the fourth greatest contributor to the Turkish economy“, the Association's website informs.

## Trade partnerships and key facts

Considering the opportunities for importing steel from Turkey, we should mention that the



country's economy has been significantly revived over the last years, namely due to its production of iron and building materials. In terms of quality Turkish iron has outperformed China, Russia, Italy and Germany. Moreover, the sector is going through a massive modernization, clearly visible especially in production of the finest types of construction iron.

Global customers of Turkish iron must go through a specific procedure to be able to import from the country. They need to have a commer-

cial register that proves the identity of an owned company and also obtain a license to work in the field of importing iron and steel. The companies need a tax card and a letter from a bank stating that they are going to transfer a particular amount out of the country. A special agreement needs to be made with a customs clearance company to help deliver the iron into the importing country. The importers are also obliged to maintain the standards that are applicable to the specifications of the products that will be purchased.

According to the Turkish Steel Exporters' Association, Turkey is currently the world's largest rebar exporter, the world's 7th largest steel producer. It is also the world's 6th biggest steel exporter and Europe's largest steel producer. Moreover, Turkey exports steel and steel products to a total of 193 countries. 72% of the steel production is from steel scrap. Furthermore, Turkey is the world's largest importer of scrap metal. In 2021 the total crude steel production in the country amounted to 40,4 million tons.

## Raw material processing in Turkey

According to the Turkish Ministry of Trade, iron factories in the country are considered one of the reasons for Turkey's progress and access to development in all fields. Some of the most important companies among the steel manufacturers in Turkey are: Iskenderun Iron and Steel Co. Inc.; Ereğli Iron and Steel Factories TAS.; Icdac Celik Energy Shipyard and Transportation



Industry Inc.; Colakoglu Metallurgy A.S.; Toscelik Profile and Sheet Industry Inc.; Borcelik Celik San. Trade Inc.; Kardemir Karabuk Iron and Steel Industry. ve Tic. Inc.; Kroman Celik Sanayii A.S.; Assan Aluminum San. ve Tic. Inc.; Bastug Metallurgy Industry Inc.; Izmir Iron and Steel Industry Inc.; Borusan Mannesmann Boru San. ve Tic. Inc.; Kaptan Iron and Steel Industry and Trade Inc.; Koc Metallurgy A.S.; etc.

Turkpidya - the online encyclopedia, dedicated to the Turkish economy, history and culture, published an article, describing the principles of raw material processing in the country. The process starts with delivering iron ore and coal, which are the main raw materials, to the facilities and keeping them ready.

The arrival of raw materials at the facility initiates the production stages. The coal is sent to the factories for preparation, and the fine ore is delivered to the sinter plant for preparation for use in the blast furnaces. Next, the coal is carried to the furnaces and turned into coke at high temperatures and in an oxygen-free atmosphere after being delivered to the coke plant silo using the requisite systems. Coke for blast furnaces is manufactured in this manner. Powdered ore and ferrous flue dusts are ground to a size suitable for use in sinter plants. Belt systems transport the product ready for iron and steel blast furnaces. Blast furnaces create liquid raw iron. Iron ore, pellets, coke, and sinter are utilized as inputs in the manufacturing of liquid raw iron.

The sulfur from the collected liquid raw iron is cleansed and transferred to the steel mill for use in manufacturing. Various techniques are used in the process to turn liquid raw iron into liquid steel. Next the liquid steel produced is shaped in the casting facilities and thus coils and sheets are produced. After being prepared to meet the needs of the customers, coils produced in hot rolling mills are cooled and transported.

## Steel production - history and development

In 2019 the Ministry of Trade of the Republic of Turkey published a paper on steel manufacturing development in the country. According to the document, as the iron and steel industry supplies input to almost all manufacturing sectors, it plays an important role in the industrialization and development of Turkey.

„The foundations of the Turkish industrialization were laid in the 1930s. The first integrated Iron and Steel Works (Kardemir) facility began to operate in Karabuk in 1939 when Turkey produced raw steel for the first time. In order to meet the demand for flat products, the second integrated plant, Ereğli Iron and Steel Works (Erdemir) started production in 1965. In 1977, Iskenderun Iron and Steel Works (Isdemir), Turkey's third integrated steel mill, came into operation to meet the demand for long products and semi-products. After the '80s, investments for the production of iron and steel by electric arc furnaces started. The takeover of Isdemir by Erdemir on condition of its conversion to flat products, which occurred as a result of liberalization in economic activities, was the most important and recent development in the Turkish steel sector. The privatization of Isdemir in 2002, which was the last state-owned facility, is also important as it steered the Turkish iron and steel industry to be entirely operated by the private sector“, the paper informs.

Today the Turkish steel industry operates 19 electric arc furnaces and three integrated works, (Kardemir, Erdemir, Isdemir) with a total raw steel production capacity of nearly 51,8 million tons per year. „In 2015 Turkey had a steel production capacity totaling 55,9 million tons, out of which some 39,1 million tons or 69,5% was for long-steel products that are mostly used in the construction sector. 16,8 million tons or 30,5% of the raw steel capacity is directed to flat products“, the document further explains.

According to data, published by the Turkish trade ministry, raw steel production in the country rose to 37,5 million tons and Turkey ranked the 8th largest steel producing country in the world by the end of 2017. By product type, 68,9% of total steel production was directed to long products and about 31,1% was for flat products in 2017. In terms of the production processes, 69,2% was electric arc furnace steel.

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# SEE NEWS

## Axpo to add 250 MW wind energy capacity in Romania



Switzerland's Axpo announced that two wind farms are in the planning stage in Romania. They will together have 38 wind turbines and a capacity of approximately 250 MW. Construction is expected to commence at the end of 2023 in locations about 100 km north-east and 200 km east of Bucharest. The facilities will produce 750 GWh of electricity a year – equivalent to the power consumption of around 375 000 Romanian households. Axpo will work closely with the local partner Aquarius Energy Developments to complete the project.

„Like the main markets of Germany and France in which we have been successful for many years, Romania holds enormous potential for the development of wind farms. We are working closely with our colleagues in our origination business, who have been offering tailored energy solutions for customers since 2003, and are confident that we can combine this experience with the Axpo Group's project implementation expertise to grow the business in Romania,” commented Iulian Alexe, responsible for Axpo's wind power business in Romania.

## Holcim Croatia receives Norway grant for low-carbon cement production



Holcim Croatia, a unit of building materials producer LafargeHolcim, announced it will receive a further grant of HRK 5 million (EUR 664 000) from Innovation Norway, a Norwegian government financial instrument, for a HRK 12,8 million project for low-carbon cement production. The project concerns warehousing, transportation and dozing of pozzolans for production of low-carbon cement and will be carried out at Holcim's factory in Koromacno, the company said in a statement on its website.

Last year Innovation Norway approved a grant of HRK 3,3 million to the cement factory in Koromacno, in Istria, on the northwestern Croatian Adriatic coast, for another project to develop new brands of cement with a low-carbon footprint. Due to an overall increase of prices, however, the contracted value of the works on the project rose to HRK 16 million from an initially estimated HRK 9,6 million.



„With the rise of new investment projects and capacity increases to production of flat steel products, the flat/long steel production imbalance in Turkish steel industry has begun to change. While flat products' share in total raw steel production was 14% in 2007, the share rose to 29% in 2015 and while long products' share in total raw steel production was 86% in 2007, the share declined to 71% in 2015”, public information also states.

Developments in the iron and steel industry have direct influence on the growth of production in iron or steel products. At present Turkey produces a wide range of iron and steel articles, which meet almost all of the domestic demand. Among iron or steel products, casting products and steel pipes and tubes have significant importance. In kitchenware and industrial kitchen products, Turkey has built a considerable capacity in recent years and has increased the exports of these items.

„With the continuous demand generated by the Turkish manufacturing industry, the casting and forgings industry of Turkey has experienced booming development both in technology and in market.

Turkish foundries, which are able to produce every kind of alloyed or unalloyed ferrous castings, specialize in the production of cast parts for domestic industries. Concerning the geographical distribution of the sector, the major foundries, which are all privately-owned, are located in Istanbul, Kocaeli, Bursa, Eskisehir, Bilecik, Izmir and Ankara. Small scale family-owned casting companies are widely spread in almost all regions of Turkey. The remarkable increase in casting production and exports is due to the increasing domestic and world demand and government policies which encouraged many entrepreneurs to invest in the foundry sector“, the trade ministry further explains.

In recent years Turkish foundry specialists

have managed to improve productivity with the use of new technologies and achieve low production cost with high quality. The developing Turkish foundry industry is currently in a phase of expansion and aims production at international standards. The casting industry in Turkey comprises of 1200 small, medium and large-sized foundries.

## Export capacities of the Turkish steel industry

Reasonable pricing and efficient marketing help local manufacturing companies export their production all over the world. The European Union was Turkey's major export market in 2021, accounting for 7,4 million tons, or 31% of the total steel exports. Another important market for Turkish steel and steel products is the Middle East area. Exports there fell by 10,9 percent in 2021 to 4,3 million tons, statistics show. The most significant growth in Turkish steel exports in terms of tonnage was to the Latin America area in 2021, with a rate of 103 percent. This region was the third with the biggest export volume with 3,1 million tons over the last year. Steel shipments from Turkey to North America recovered in value in 2021 and reached 1,9 million tons. Meanwhile, exports to North Africa fell 12,3 percent to 1,8 million tons over the same year.

Having in mind the positive direction of the country's economy development in common, the iron and steel industry has demonstrated a distinctive growth in both exports and domestic demand. Iron and steel exports of Turkey include pig iron, scrap, flat steel, billet, bloom, flat products, long products, special steel products, pipes and tubes, pipe fittings, elements and parts, stranded wires and ropes, screws, bolts, stoves, barbecues, radiators, kitchen articles, etc.

„Iron and steel long products with an export

value of USD 7,1 billion were the largest product group in sector exports in 2017. Flat products with an export value of USD 1,8 billion were one of the largest product groups. Iron and steel pipes exports also ranked high with a value of USD 1,6 billion in 2015. The other important iron and steel products in exports were steel billets (USD 1,5 billion) and structural steel and parts (USD 1,1 million)“, the Trade Ministry report informs.

The main iron and steel exports of Turkey by country (measured in millions of US dollars) are to: USA, Iraq, UAE, Egypt, Germany, The United Kingdom, Israel, Turkmenistan, Romania, Italy, Algeria, Saudi Arabia, Morocco Ethiopia, France, Spain, Azerbaijan, The Netherlands, Yemen and Iran.

### Modern Turkish steel industry

In 1996, The European Coal and Steel Community (ECSC) agreement was signed between the EU and Turkey. With signing the agreement, customs duties on bilateral steel trade were abolished. The agreement allows Turkey to trade its iron and steel products without customs duty with all EU member states. Additionally, the Government does not subsidize Turkish domestic steel industry due to the European Coal and Steel Community (ECSC) agreement, the Turkish Ministry of Trade reports in a current paper.

All steel companies in the country are privately held. Turkish steelmakers continue to pursue technological developments to enhance the long-term viability of the industry in the global marketplace. The steel industry has become one of the most developed sectors in Turkey and today counts as the fourth largest contributor to the Turkish economy, official data shows.

After 1980, with the implementation of import substitution system, Turkey has increased its steel export to primarily neighboring countries such as Iran, Iraq and North African states. In the next 20 years, Turkey has realized a major production and export boom, the trade ministry points out.

„While Turkey was the world’s 10th biggest steel producer in 2001, the country has become the 7th biggest producer globally and the largest steel producer in Europe in 2020. In fact, it was the third fastest growing steel producer in the world between 2001 and 2011, after China and India. Steel production in Turkey has increased significantly since 2001, growing from 15 million tons (mt) in 2001 to 40,4 million tons in 2021. Growth of the industry has been driven by strong domestic consumption. Turkey’s crude steel consumption has increased by 13,2% to 33,4 million tons in 2021 and is expected to continue to grow in the medium and long term. In addition to the strong domestic demand and dynamic steel using industries,

Turkey’s well placed position also supports exports and production“, the also report says.

### Branch organizations

The Turkish Steel Exporters’ Association (TSA) is one of 6 associations, which have been operating under the body of General Secretariat of Istanbul Mineral and Metals Exporters’ Association (IM-MIB). Established in 2005, today it has a total of 2280 members, which contribute with 40,4 million tons of steel to the total production of the country.

The Association is a non-profit business organization of different-sized companies representing the largest steel producers and exporters in the Turkish steel industry. It carries on its operations with the aim of increasing the export potential of the Turkish steel industry and paves the way for Turkish steel producers/exporters, with main objective to foster and attain sustainable global steel market based on free and fair trade. The Association also solves the problems its member companies face at home and abroad, provides contact between members and foreign importers in order to ease the export processes, provides up-to-date domestic and global market news, reports and analyses.

According to the website of the Association, its mission includes developing and implementing the strategies in order to increase the share of the Turkish steel exports in global markets and to maintain a sustainable global competitive strength. The organization aims to guide and assist the members of the Turkish steel sector to become a leading factor in the global steel trade.

TSA has been working on many different activities in order to increase its place in the world steel market. In parallel with this purpose, it especially carries out the following activities: market research, organizing international B2B meetings, national and international PR activities, export promotion, consulting and assistance for the Turkish steel industry, and providing support in international trade disputes.

The Turkish Steel Exporter’s Association is a business association and it is a media partner of many national and international conferences. By promoting these events, the association provides various benefits to its members and partners.

„Cooperating is one of the most important features in this rapidly increasing competitive environment. For this reason, the Turkish Steel Exporters’ Association connects a significant portion of Turkish steel exporters with the world in order to enhance Turkish steel’s capacity in foreign markets“, TSA’s website also states.

The Steel Exporters’ Association carries out its operations with the aim of increasing the export potential of the Turkish steel industry and it supports Turkish steel producers/exporters with its main objective to foster and attain sustainable global steel market based on free and fair trade, the association further explains.

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# 9<sup>th</sup> edition of Supply Chain & Logistics Expo to be held in October 2023

New companies, expanded partnerships, high-tech applications, alternative fuel solutions in corporate vehicle fleets, form the new reality in the wider industry sector, which will have a first-class opportunity to present its upgraded image and development prospects at the double 9th International Exhibition Supply Chain & Logistics – Cargo Truck & Van Expo between 14 and 16 October 2023, at the Metropolitan Expo in Athens. The 3 main areas of the exhibits are transport services and logistics, warehouse equipment and technologies, commercial vehicles and green transport.

Visitors of the double exhibition are businessmen and executives of all sectors of craft and trade as well as the sector of freight transport from Greece and abroad. More specifically, they consist of the following categories of companies: commercial companies of all sectors that have warehouses and need to transport products; wholesale and retail, online stores, supermarket chains; industries of all branches such as food industry, pharmaceutical industry, building materials, agricultural products, etc.; transport companies, logistics, distribution, courier and storage companies; companies with distribution and transport fleets, owners of trucks; commercial



Photo: O.MIND CREATIVES

warehouse organization and equipment companies; public organizations, local authorities.

According to the event organizer O.MIND CREATIVES, benefits of participation in the exhibition, which is the only one that concerns the whole supply chain and logistics market, and presents solutions in equipment, technologies and services, include: becoming part of a great national effort to promote Greek logistics in the interna-

tional market; boosting corporate brands through important professional contacts and collaborations; promoting products, equipment and services to a large group of buyers and entrepreneurs; expanding the clientele with new potential customers; opportunity to talk to important business people that are difficult to meet; strengthening relationships with existing customers; introduction to new markets; contacting international networks.

## Preparations underway for MAKTEK Eurasia 2022

One of the most prominent hubs in Eurasia for machine tools and sheet processors, core elements of production in machine and manufacturing industry, MAKTEK Eurasia 2022 Fair continues its preparations to welcome its visitors at TUYAP Fair Convention and Congress Center in Istanbul between September 26 and October 1. Organized in collaboration with Machine Tools Industrialists and Businessmen Association of Turkey (TIAD) and the Association of Turkish Machine Manufacturers (MIB) and the support of Turkish Ministry of Science, Industry and Technology, Republic of Turkey Ministry of Economy and KOSGEB, the preparations for the fair to bring together over 1000 brands and brand representatives with industry professionals are at full steam. Expanding business networks, reaching new markets and increasing the geographical diversity of both exhibitors and visitors are the main focuses of the event for this year.

In 2018 the number of visiting countries increased by 46% compared to 2016, with 56 526 industry professionals visiting the event to the satisfaction of exhibitors. The fair also hosted the „Meeting of Women in Industry“ and the „MAKTEK Golden Compass 1st National CNC Tooling Lathe Design Contest“ to bring a fresh perspective on the industry. The fair attracted 52% more foreign visitors compared to 2016, proving its position as a center of attraction in Turkey and the region. The number of visiting countries increased by 46% in comparison to 2016, showing MAKTEK's sustainability as a landmark event.

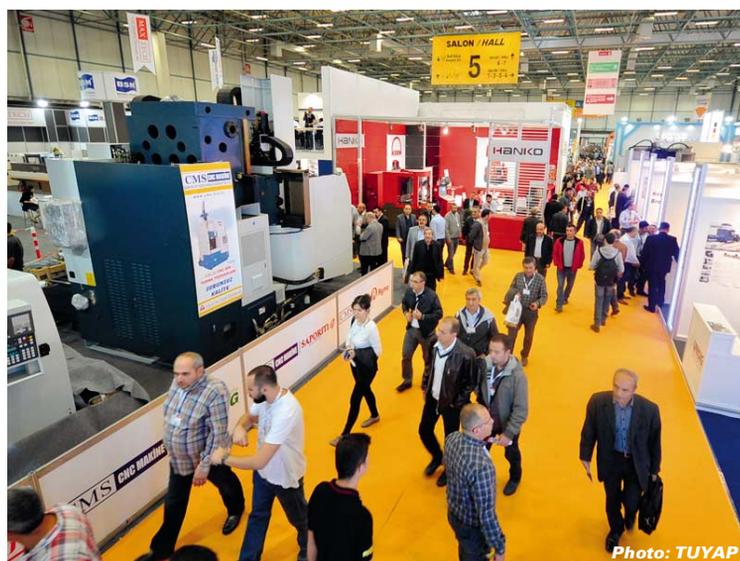


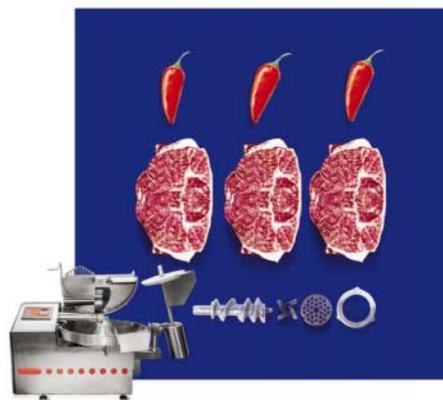
Photo: TUYAP

The scope of the fair encompasses automation systems, CAD/CAM/CAE & PLM software, CNC and conventional metalworking technologies, CNC control systems, cutting tools/holders, heat treatment equipment, Industry 4.0 and IIoT systems, lubrication and cooling solutions, measurement, quality control and testing equipment, sheet metal processing machinery, transport systems, welding machines and spare parts.

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# WorldFood Istanbul to be held for the 30<sup>th</sup> time

The International Food Products and Technologies Exhibition WorldFood Istanbul will be held for the 30th time this year on September 1 – 4. Many brands and manufacturers specializing in retail chains, canned food, beverages, dairy products, meat and chicken products, fish and sea products, fresh vegetables, fruits, frozen products, staple food and oils, sugary products, baked goods, and food additives will take part in the WorldFood Istanbul Exhibition.

WorldFood Istanbul, one of the most important exhibitions in the food industry, is assuming an important role by hosting leading actors shaping the industry, introducing new products to visitors and with its attracting events and wide participant profiles.

The 29th WorldFood Istanbul, which was held in 2021, became the largest exhibition on square meter basis in its history and it achieved great success by reaching the highest number of visitors ever. With its „Safe Trade, 365-Day Exhibition“ approach, WorldFood Istanbul hosted a total of 179 buyers from 40 countries and 22 800 visitors, 23% (5,237) of whom are foreigners, throughout four days. Organized by Hyve Group, WorldFood Istanbul, one of the most important meeting points of the food industry, will bring up the latest developments that shape the food industry in cooperation with the leading institutions and organizations in the industry in 2022, as well. The exhibition receives a lot of attention from the companies based on the commercial success created by participants and companies in 2021.



Photo: Hyve Group

WorldFood Istanbul continues its efforts to bring together around 600 foreign and local exhibitors with tens of thousands of visitors this year as well. 80% of occupancy rate is achieved in exhibitor quota, and there is still demand for participation and the registration process continues. This year, more than 300 professional buyers from the Middle East, the Commonwealth of Independent States, Africa, and the Americas are expected to participate under the Hosted Buyer Program.

## Eco Wave 2022 to showcase latest technologies for the green economy

Eco Wave is the only B2B trade fair for environmental technologies in Slovenia and the CEE region. It is designed in 7 modules – Water and sewage, Waste Management and Recycling, Air Quality, Renewable Energy, Soil Decontamination, Environmental technologies and Analysis and Laboratory Techniques and ICT. Each module is related to sustainable development and the green economy. The event takes place every year at the Ljubljana Exhibition and Convention Center in the Slovenian capital. This year the exhibition will take place between 20 and 22 September.

„Eco Wave is a great promotional platform. By presenting their products, solutions, and services in one place in a limited time, exhibitors generate the optimum effects of the fairs and personal contacts. It is also an educational platform. Exhibitors share their expertise and good practices within the Business Forum by reading lectures, making demonstrations, taking part in panel discussions, and organizing workshops. The event helps improve brand awareness, strengthen the corporate image, monitor the competition and, last but not least, increase employee motivation. Eco Wave creates new business oppor-



Photo: ICM

tunities to engage with strategic partners. Visitors to the fair are looking for reliable business partners and useful solutions to their problems, and want to gain knowledge. The fair offers many opportunities to build new business relationships and foster existing ones. Each exhibitor receives a free unlimited number of invitations for business partners and the invitation/on-line registration is considered a ticket. Participation in the fair

is cost-effective as it grants access to the Slovenian and other regional markets only in 3 days and enables optimal interaction“, states organizer ICM.

Visitors of Eco Wave are managers and executives responsible for strategic planning and procurement, government officials, experts, researchers, technicians, media representatives, and others.

# EBRD's Green Cities Programme helps Sarajevo on its way to sustainability

Sarajevo is evolving – several construction sites around the city – from extensions to tram tracks to refurbished public buildings – are changing the landscape and lifting spirits because people can see the investments are being made in its future. Thanks to these developments, Sarajevo will be more resilient and sustainable, with improved environmental and living conditions.

Many of these developments started a few years ago when Sarajevo joined the EBRD's Green Cities Programme. The initiative supports cities in identifying and planning priority projects that can help them become greener and more sustainable. The EBRD also provides financing for such investments, often co-financed with grants by the European Union (EU), and other donors.

One of the main concerns in Sarajevo is air pollution. It can reach hazardous levels, especially during the winter. So to reduce traffic congestion and pollution the city is encouraging people to use public transport instead of private cars. This is done through much-needed investment in the transport network, which will make services faster and more efficient. For example, 35 new trolleybuses will arrive in the city by the end of 2022, financed by EBRD and European Investment Bank (EIB) loans. In fact, they will be the first new trolleybuses that the city has purchased since the Winter Olympics 38 years ago. These new zero-emission trolleybuses can run on a battery and can produce and store enough energy to run without charging for 20 hours.

The tram network is also being improved. New and extended tracks will allow the roll-out of faster and more modern trams and connect some new districts in the city where the tram service didn't previously exist.



40 buildings in the city will be renovated as part of this project, financed with an EUR 8 million EBRD loan and a EUR 2 million European Union (EU) grant. The investments will cover 29 schools and related facilities, 6 kindergartens, 3 student blocks and 2 outpatient clinics. The energy savings are estimated to be around 13,7 GWh, resulting in CO<sub>2</sub> reduction equal to removing around 1000 cars from the street.

Another way Sarajevo is becoming greener is by improving its water supply. A EUR 25 million EBRD loan and EUR 4 million grant from the EU through the Western Balkans Investment Framework have allowed the city to modernise its water and sewerage infrastructure. This will help reduce water leaks in the network and secure more efficient and reliable water and wastewater services in the canton of Sarajevo.

„We are truly proud of our joint work with Sa-

rajevo canton and the progress they have made since joining our Green Cities programme, taking advantage of all the opportunities on offer. We are already investing in the eight projects with the Canton and once completed these projects will have a remarkable impact on the city environment,” explains Manuela Naessl, EBRD Head of Bosnia and Herzegovina.

„Investing in the green economy remains one of our key strategic priorities and the EBRD and its donors stand ready to provide finance and support for it. We look forward to developing new projects including a renewable energy district heating system, which we are currently exploring.“

Green City projects in Sarajevo are supported by the European Union, Austria, Japan, Central European Initiative, Italy and the Western Balkans Investment Framework.

## Companies in this issue

Endrich Bauelemente Vertriebs .....	3	Neomontana Electronics .....	9
HIWIN .....	19	Radiy .....	13
IndSoft .....	24	SAT .....	1, 15
Inter Expo Center .....	11, 21	Schwabische Werkzeugmaschinen .....	17
International Technical Fair .....	8		
IOW Bulgaria .....	1		
JAKSA .....	2		
Microchip Technology .....	5		

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