SRIP MATPRO

Gospodarska zbornica Slovenije
Chamber of Commerce and Industry of Slovenia

SRIP MATPRO NA POTI K TRAJNOSTI
SRIP MATPRO ON THE WAY TOWARDS SUSTAINABILITY

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EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA GOSPODARSKI RAZVOJ IN TEHNOLOGIJO

Operacijo sofinancirata Republika Slovenija in Evropski sklad za regionalni razvoj. The investment is co-financed by the Republic of Slovenia and the European Regional Development Fund.

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Ljubljana, junij/June 2021

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Brošuri *SRIP MATPRO na poti k trajnosti* na pot

V posebno čast mi je, da lahko kot predsednik SRIP-a MATPRO zaželim srečno pot in uspešno promocijo brošuri *SRIP MATPRO na poti k trajnosti,* ki je luč sveta ugledala prav na jubilejni, 20. okoljski dan gospodarstva. Nabor predstavljenih podjetij v besedi in sliki je širok in raznolik, brošuro pa bogatijo tudi uvodni strokovni članki.

Evropski zeleni dogovor s ciljem podnebne nevtralnosti do leta 2050, Nova industrijska strategija za Evropo, Strategija za MSP za trajnostno in digitalno Evropo nam govorijo, da bo zeleno, krožno in trajnostno tako v gospodarstvu kot v celotni družbi med ključnimi izzivi sedanjega in prihodnjega časa. Zlasti industrija, še posebej energetsko intenzivne panoge, morajo zato razmišljati ne le o zmanjšanju svojega ogljičnega odtisa, ampak tudi o razvoju novih, čistih tehnoloških procesov po sprejemljivih cenah in novih poslovnih modelih. Pri tem zelenem prehodu bo imela pomembno vlogo tudi pomoč in podpora države in EU.

Sodelujoči v pričujoči brošuri so poleg predstavitve ključnih dosežkov, proizvodov in storitev, zgodovine in vizije, uvodoma zapisali svoj moto k podnebni nevtralnosti in tako pokazali, da sta odgovornost in skrb za zeleno prihodnost resnično vtkana v vse njihovo delovanje. Še posebej pa nas veseli, da so nekatera podjetja že navedla tudi svoj ogljični odtis.

Prepričan sem, da bomo novim izzivom v skladu z evropskimi usmeritvami lahko kos le s povezovanjem in medsebojnim razvojnim sodelovanjem gospodarstva, znanstveno-raziskovalne sfere, države in drugih relevantnih deležnikov. Kot dokazuje dosedanje delovanje SRIP-a MATPRO in njegovih članov, je to prava formula za doseganje odličnih rezultatov na področju razvoja novih znanj, novih tehnologij in novih produktov, kar prispeva k dvigu dodane vrednosti in izboljšanju naše globalne konkurenčnosti.

Naši skupni, dvojezični brošuri želim veliko spletnih ogledov in uspešno distribucijo knjižice doma in v tujini!

Marko Drobnič,
predsednik uprave družbe Talum
Predsednik SRIP-a MATPRO

SRIP MATPRO On The Way Towards Sustainability

As SRIP MATPRO president, I find it a special honour to wish the SRIP MATPRO brochure, Towards Sustainability, which has been prepared at the time of the 20th environmental business day jubilee, a bon voyage and successful promotional journey. The list of companies being presented in the brochure is wide and varied; the selection of scientific articles enriching.

The New European Green Deal with a target towards climate neutrality by 2050, the new European Industrial Policy, and SME strategy for a sustainable and digital Europe proclaim the transition to green, circular and sustainable as a key challenge which will need to be tackled by business and society alike both now and in the foreseeable future. Industry, with emphasis on energy intensive industry, needs to contemplate not only the reduction of its carbon footprint, but also the development of new clean technological processes and business models at acceptable cost. Both member states and EU institutions have an important role to play to provide these industries with aid and support for this transition.

Within the brochure, its contributors have provided not only insight into their key achievements, products and services, history and vision, but have also stated their guiding motto towards climate neutrality, displaying responsibility and concern for a greener future as an intrinsic component of their business activities. It is of great pleasure to note that some of the companies have provided a value of their carbon footprint.

I am certain that it will be possible to confront the challenges presented by new European strategies only united through the cooperation of the business sector and scientific research community, state institutions and other relevant stakeholders. As has been proven by SRIP MATPRO and its members to date, this is the true recipe to achieve excellence based on new knowledge, new technologies and new products, contributing to an increase of added value and the improvement of global competitiveness

I wish our shared, bilingual brochure many views on its website and its successful distribution both at home and abroad.

Marko Drobnič,
Chairman of the board of Talum
President SRIP MATPRO

Strateško razvojno-inovacijsko partnerstvo Materiali kot končni produkti (SRIP MATPRO)

Strateško razvojno-inovacijsko partnerstvo Materiali kot končni produkti (SRIP MATPRO) je bilo oblikovano leta 2017 na pobudo Strateškega sveta za metalurgijo kot del nacionalne strategije pametne specializacije. Skupaj s prijaviteljem projekta, Gospodarsko zbornico Slovenije, šteje danes 61 članov, v evropskem in svetovnem merilu priznanih podjetij in institucij znanja. Vključuje področja metalurgije - kovinskih materialov in multikomponentnih - nekovinskih materialov. Temelji na velikem potencialu razvoja materialov kot novih produktov, glavni cilj delovanja pa je vzpostavitev verig vrednosti s poudarkom na proizvodnji materialov, namenjenih proizvodnji kompleksnih, visokotehnoloških izdelkov z visoko dodano vrednostjo in velikim potencialom za še uspešnejšo umestitev v globalne vrednostne verige. Med ključne naloge SRIP-a MATPRO sodijo tudi vzpostavljanje partnerskih povezav in sodelovanje znotraj partnerjev SRIP-a, med partnerji različnih SRIP-ov in ključnih omo-gočitvenih tehnologij ter s povezovanjem partnerjev SRIP-a MATPRO v mednarodne verige vrednosti, iniciative in mreže, pa tudi kontinuiran dialog z državo.

Vizija SRIP-a MATPRO je biti ključni akter v konkurenčnem in inovacijskem napredku slovenske industrije na področju materialov. Naši cilji so konkretni in neposredno povezani s potrebami industrije. Prizadevamo si povečati dodano vrednost v sektorju, ohranjati visoko kvalitetne zaposlitve in podpirati inovativnost. Dolgoročni cilj SRIP-a MATPRO je, da bo slovenska industrija materialov prepoznana kot ena najbolj inovativnih in uspešnih ter zaželen in idealen kandidat za najbolj prodorne globalne verige vrednosti.

Kot je rekel Lao Tze, se tudi najdaljše potovanje začne s prvim korakom. Brošura SRIP MATPRO na poti k trajnosti združuje vpogled tako v nove, odlične, reciklabilne materiale bodočnosti kot tudi v načrte in izzive slovenskih podjetij, ki bodo tudi v bodoče gradila na preverjanju in zmanjševanju svojih vplivov na okolje ter predstavlja vpogled v začetne korake za prehod v podnebno nevtralno, krožno gospodarstvo.

Vesna Nahtigal,
koordinatorka SRIP-a MATPRO

Strategic research-innovation partnership Materials as end products (SRIP MATPRO)

The Strategic research-innovation partnership Materials as end products (SRIP MATPRO) was founded in 2017 on the initiative pf the Strategic Council for Metallurgy within the national smart specialisation strategy. Together with, founder Chamber of Commerce and Industry of Slovenia, it currently consists of 61 members, from companies and knowledge institutions recognised for their excellence both in Europe and the World. The partnership focuses on metallurgical materials - metals and multicomponents – nonmetal materials. It is based on the great potential for development posed by materials. Its main operational objective is the formation of value chains emphasising the development of materials intended to produce complex, high-tech products with a higher added value, and their successful integration into global value chains. Key SRIP MATPRO tasks include forming partnership networks and cooperating within the SRIP partnership, fostering cooperation amongst partners of different SRIPs as well as key supporting technologies and linking SRIP MATPRO partners to international value chains, initiatives, and networks with a continuous state dialogue.

The SRIP MATPRO vision is to become a key player in the competitive and innovative development of the industry, producing materials, in Slovenia. Our objectives are concrete and directly linked to industry needs. We endeavour to increase added value within the sector, maintain high quality employment and support innovativeness. Long term SRIP MATPRO objectives see this industrial sector of Slovenia as being recognised as one of the most innovative and successful, desired ideal candidates for partnerships in the most promising global value chains of the future.

As stated by Lao Tze, even the longest journey begins with the first step. Our brochure, SRIP MATPRO On The Way Towards Sustainability, offers a glimpse into the initial steps towards a climate neutral circular economy and offers insight into new, excellent, recyclable materials of the future, as well as the plans and challenges being faced by companies, planning to work on the evaluation and improvement of environmental aspects on the way towards a carbon neutral, circular economy.

Vesna Nahtigal,
SRIP MATPRO coordinator

Upoštevaje evropski Zeleni dogovor in akcijski načrt za krožno gospodarstvo Za čistejšo in konkurenčnejšo Evropo v SRIP-u MATPRO poudarjamo tudi pomen okoljske sledljivosti in medsebojnega sodelovana deležnikov pri transparentnem trajnostnem, nefinančnem poročanju po vrednostni verigi. To bo v prihodnosti pomembno tudi za pridobivanje sredstev za financiranje projektov s strani finančnih ustanov, ki v svojih storitvah že napovedujejo večjo vključitev preverjanja okoljskih vidikov. V ta namen je GZS-Služba za varstvo okolja v pomoč pri pripravi ocene neposrednih in posrednih izpustov toplogrednih plinov podjetij razvila metodologijo spremljanja emisij toplogrednih plinov v skladu z navodili, ki se oblikujejo pod blagovno znamko Greenhouse Gas Protocol za tovrstno poročanje. Proizvodnja materialov, ki se praviloma izvaja v industriji, ki velja za energetsko intenzivno, je ključna za oskrbo drugih gospodarskih vrednostnih verig. Evropski zeleni dogovor prepoznava, da predstavlja obstoj energetsko intenzivne industrije v EU pomembno konkurenčno prednost za proizvodnjo visoko tehnoloških proizvodov v avtomobilski in kemični industriji. To prepoznava tudi evropska industrijska strategija, ki se osredotoča na verige vrednosti. Na ravni EU ocenjujejo, da bo potrebno večino naložb za prehod v podnebno nevtralnost izvesti v tem desetletju (2020). S tem izzivom se bodo srečevale vse panoge, začenši z energetsko intenzivnimi, ki predstavljajo hrbtenico evropske reciklažne industrije in krožnega gospodarstva.

Vrednosti za ogljični odtis, ki ga navajajo posamezna podjetja, so indikativne in niso zasnovane za primerjanje niti med posameznimi podjetji niti ne med podjetji iz iste panoge. Primerjava bi bila mogoča le, če bi bile predstavljene vrednosti podjetij opremljene z obsegom in metodo opravljenega izračuna.

In view of the European Green Deal and the Action Plan for a circular economy for a cleaner and more competitive Europe, SRIP MATPRO emphasises the need for environmental transparency and traceability through open cooperation amongst stakeholders to prepare transparent, sustainable nonfinancial reports along the value chain. This transparency will be important in the future for acquiring project funds from financial institutions, which will be incorporating environmental aspects into their services. Due to this, the Chamber's Environmental Protection Department developed a methodology to be followed by companies to evaluate their direct and indirect greenhouse gas emission in line with guidelines prepared under the trademark of the Greenhouse Gas Protocol for greenhouse gas reporting by organisations. Material production, frequently linked to energy intensive industrial processes, is also a key player for the supply of other value chains. The European Green Deal recognise the presence of energy intensive industry in the EU as an important competitive advantage to produce high-tech products within the car and chemical industry. This is also reflected in the European Strategy for industry which is centred on value chains. The EU estimates that most of the investments required for Europe's transition into a climate neutral, circular economy will need to be done in this decade (2020). This is a challenge that needs to be addressed by all sectors of the economy, beginning with energy intensive material production, which represents the backbone of Europe's recycling sector and transition towards a circular economy.

The carbon footprint values presented for individual companies are indicative and are not meant to be compared either between the companies per se or for their sector. This comparison would be possible if the values were accompanied with information on the calculation method and scope.

ALUMINIJ – LAHEK MATERIAL PRIHODNOSTI

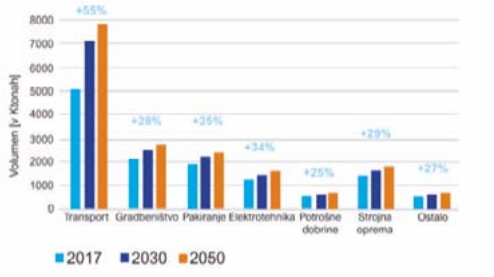
dr. Jožef Medved

Naravoslovnotehniška fakulteta Univerze v Ljubljani, Oddelek za materiale in metalurgijo

Slika 1: Aluminij, lahka kovina srebrne barve (foto: arhiv Talum, d. d.).

Aluminij (slika 1) je lahka kovina značilne srebrnkastobele barve in je najbolj razširjena kovina v zemljini skorji. Zaradi poznega odkritja in načina pridobivanja ga imenujemo kovina moderne dobe. Čisti aluminij je močnega sijaja in je mehak. Že zaradi majhnih količin primesi na površini posivi in postane trši. Je dober električni in toplotni prevodnik. Ker je lažji od bakra, je njegova prevodnost na enoto mase celo boljša od bakrove. Na zraku in v oksidacijskih sredstvih je zelo obstojen, ker se prevleče s tanko, a gosto zaščitno oksidno kožico, ki je tem tanjša, čim čistejši je aluminij. Zelo obstojen je tudi v organskih kislinah, zato ga uporabljamo v živilski industriji.

Svetovna proizvodnja primarnega aluminja je leta 2018 znašala 65,3 mil. t in se je v zadnjih desetih letih povečala za 22 %, več kot polovico ga je proizvedla Kitajska. Po ocenah se predela tudi med 25 in 30 mil. t sekundarnega aluminija. Do leta 2050 se v EU predvideva povečanje porabe aluminija za 40 % na 18 mil. t (slika 2).



Slika 2: Predvideno povečanje porabe aluminija v EU do leta 2050 (vir: https://www.european-aluminium.eu).

V Sloveniji smo leta 2019 proizvedli skupaj 443.656 t. V primerjavi z letom 2014 (skupaj 360.244) se je proizvodnja povečala za 23 %.

Aluminij je kot najpomembnejša neželezna kovina osnova za številne zlitine, ki jih delimo na gnetne in livne. Primarni aluminij uporabljajo predvsem v elektroindustriji in tam, kjer ni potrebna velika natezna trdnost, sta pa potrebni dobra preoblikovalnost in korozijska odpornost. Glede na osnovni legirni element delimo aluminijeve zlitine v osem skupin. Kompoziti na osnovi aluminija (AMC) so utrjeni s keramičnimi ali polimernimi vlakni ali delci oziroma nanodelci in imajo izboljšane mehanske lastnosti in dobro duktilnost. Uporabljajo

jih za posebne namene v avtomobilski in letalski industriji. Aluminijeve pene sodijo na področje kovinskih pen in jih uporabljajo za različne namene, kot so absorberji energije pri trkih avtomobila, v zadnjem času pa tudi za medicinske proteze.

Aluminij in njegove zlitine so popolnoma reciklabilne (slika 3), zato je aluminij okolju prijazen material. Z majhnimi izgubami ga lahko pretaljujemo in znova uporabimo. Poraba energije pri recikliranju je majhna in znaša samo 5–10 % porabe pri proizvodnji primarnega aluminija – aluminij je zato odličen hranilnik energije. Če so odpadki prej obdelani oziroma ustrezno razporejeni,

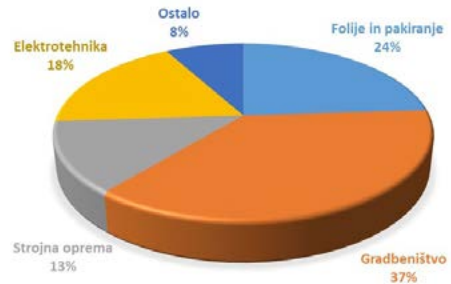
Slika 3: Aluminij je okolju prijazen material, ker je popolnoma reciklabilen.

je mogoče recikliran aluminij uporabiti za skoraj vse namene, pri tem pa se ohranjajo naravne surovine in prihrani energija.

Predelavo aluminijevih sekundarnih surovin sestavljajo: priprava surovin, razvrščanje, taljenje, legiranje, obdelava taline, čiščenje taline in litje. Pri pripravi je treba sekundarne surovine zdrobiti in razmastiti, žlindro zmleti in presejati, odrezke pločevine in folije paketirati, mehansko pritrjene železne dele pa odstraniti v odcejalnih pečeh. Evropska unija (EU) je v recikliranju na prvem mestu na svetu z 11 kg recikliranega aluminija na prebivalca. Sledijo Severna Amerika z 9,5 kg recikliranega aluminija na prebivalca, Kitajska nekaj več kot 6 kg, Latinska Amerika malo več kot 2 kg. Svetovno povprečje je 4 kg recikliranega aluminija na prebivalca.

Aluminij v EU uporabljamo v petih ključnih strateških aplikacijah (slika 4): mobilnost, gradbeništvo, pakiranje, tehnika in splošna uporaba. Glede na življenjsko dobo (gradbeništvo 40 let, pakiranje nekaj mesecev) lahko načrtujemo količino in strukturo sekundarnega aluminija. Na ravni EU je že dosežen konkreten prispevek h krožnemu gospodarstvu, in sicer je doseženih že 71,3 % recikliranja odpadnih aluminijskih pločevink - 7 pločevink od 10-ih se torej vrne v predelavo, in dosežen je več kot 90-odstotni masni delež pri recikliranju aluminijskih delov avtomobilov.

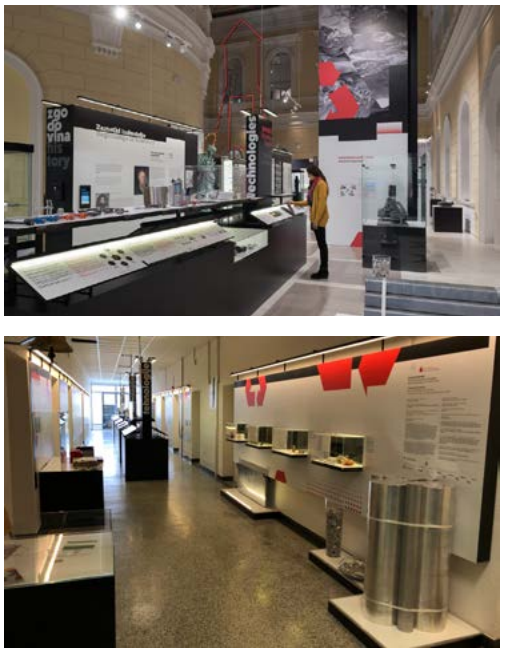
Uporaba aluminijevih zlitin v avtomobilski industriji se povečuje. V avtomobilu je danes povprečno več kot 210 kg aluminijevih zlitin. Uporaba aluminija v avtomobilih zmanjša njihovo težo in torej tudi porabo goriva in izpust CO_2. Zmanjšana masa vozila izboljša tudi varnost, vozne lastnosti in poveča udobnost. Velik porabnik aluminija je tudi gradbeništvo. Uporablja predvsem aluminijeve profile in pločevine (26 mas. %). Razlog za trajnostni uspeh aluminija v gradbeništvu je njegov življenjski cikel, dobro razmerje med trdnostjo in maso, majhni stroški vzdrževanja, požarna varnost.



Slika 4: Delež porabe aluminijevih zlitin po industrijskih panogah (vir: https://www.world-aluminium.org).

Uporaba aluminija v gospodinjstvih in za pisarniške namene je pogosto posledica modnega oblikovanja aluminija, na primer v kuhinjah ali pri načrtovanju ročajev na vratih. Pri gospodinjskih aparatih, kot so likalniki in posoda za kuhanje, so toplotne lastnosti aluminija odločilne. Aluminij je pomemben material pri izdelavi embalaže, saj zagotavlja primerno zaščito in preprosto shranjevanje različnih izdelkov, kot so brezalkoholne pijače in mila, hrana, tobak, čokolada in zamrznjena živila in zdravila. Aluminijasta embalaža je postala del našega vsakdanjega življenja. Aluminij embalaži zagotavlja visoko stopnjo odpornosti proti koroziji. Pri pakiranju občutljivih izdelkov, kot so zdravila ali živila, je aluminij higieničen, nestrupen, brez kontaminacije in ohrani okus proizvoda. Aluminij za električne in toplotne namene uporabljamo predvsem zaradi dobre električne in toplotne prevodnosti zlitin. Skoraj vse električne luči, motorji in naprave so odvisni od aluminijaste žice. Po vsem svetu je večina visokonapetostnih daljnovodov, distribucijskih linij in podzemnih vodov iz aluminija. Aluminij uporabljajo tudi v jeklarski industriji za dezoksidacijo jekla, da preprečijo krhkost in izboljšajo odpornost jekla pri nizkih temperaturah.

Slovenija ima velik potencial na področju naprednih kovinskih materialov, predvsem v tehnološko razvitih podjetjih z lastnim razvojem, kar je bilo prikazano tudi na razstavi Ko zapoje kovina, ki je bila na ogled v Narodnem muzeju Slovenije od decembra 2018 do avgusta 2019, nadaljevanje razstave pa poteka v prostorih NTF-OMM na Lepem potu 11 (slika 5). Tako kot EU, je tudi Slovenija v težnji po reindustrializaciji prepoznala metalurgijo kot eno izmed ključnih strateških področij, ki je danes eden izmed najmočnejših tehnoloških sektorjev z velikim razvojnim potencialom. V primeru aluminija sta trenutno največje gonilo razvoja avtomobilska in letalska industrija, aluminijeve zlitine pa imajo velikanski potencial tudi v širokem spektru drugih področij, kot so medicina, farmacija, vojaška industrija, notranja oprema. Predvsem v segmentu avtomobilske industrije je cilj razvoj novih visokotrdnostnih in korozijsko odpornih zlitin aluminija, ki naj bi združevale 100-odstotno reciklabilnost, majhno maso, visoko nosilnost, s tem pa zmanjšano prostornino komponent in varnost z absorbiranjem energije. Zaradi velikega potenciala aditivnih tehnologij, kot je 3D tisk, je v prihodnosti treba povečati aktivnosti pri razvoju novih aluminijevih materialov in tehnologij izdelave prahov oziroma drugih polizdelkov za takšne namene. Nove aluminijeve zlitine na področju letalske industrije so poleg zlitin s standardnimi zlitinskimi elementi še mikro legirane zlitine s kombinacijami elementov Mo, Sc, Zr in Er. Pomembno področje je tudi razvoj zlitin in tehnologij za izdelavo profilov, odpornih pri trkih, za avtomobilsko industrijo.



Slika 5: Razstava Ko zapoje kovina predstavlja pomen kovin v Sloveniji (foto: Arhiv NTF-OMM).

Druga koraka za izdelavo ultra čistih aluminijevih zlitin z visokimi mehanskimi lastnostmi in dobro korozijsko obstojnostjo sta uvedba novih in izboljšave obstoječih tehnologij, kot so: postopki legiranja, rafinacije taline, obdelave z udrobnjevalnimi in modifikacijskimi sredstvi ter ustrezni potek strjevanja in termo-mehanske predelave. Perspektiva primarne proizvodnje aluminija je okoljsko bolj sprejemljiv proces proizvodnje z uporabo zelenih inertnih anod, pri katerih celica poleg aluminija proizvaja kisik in porabi 20 % manj energije. Tehnologije hitrega strjevanja ob pravilno vodenem postopku ekstruzije in ustrezni kemijski sestavi omogočajo doseganje superiornih korozijskih in mehanskih lastnosti. Pomemben del izdelave zlitin je toplotna obdelava, a je v primeru precipitacije dvo- ali večfaznih delcev zelo kompleksna. Za dosego ustrezne velikosti mikrostrukturnih sestavin zlitine in s tem najboljše mehanske lastnosti je treba optimirati vrsto in delež dodatkov za udrobnjevanje in modificiranje, temperaturo in čas delovanja.

Modernega razvoja materialov in tehnologij si seveda ne moremo predstavljati brez modernega raziskovalnega dela v dobro opremljenih laboratorijih (nekaj takšne opreme NTF-OMM je prikazane na sliki 6) in modeliranja materialov in procesov izdelave naprednih aluminijevih materialov. Potrebno je tudi vzpostaviti prenos znanja iz znastveno-raziskovalnih institucij v industrijo. Zato je nujno potrebno vzpostaviti Slovenski pilotni center za napredne strjevalne tehnologije lahkih kovin – SiPCAST.

Slika 6: Raziskovalna oprema v laboratorijih NTF-OMM (foto: Arhiv NTF-OMM).

ALUMINIUM – THE LIGHWEIGHT MATERIAL OF THE FUTURE

dr. Jožef Medved

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Figure 1: Aluminum, light metal of silver color (Photo: Talum archive, d. d.).

Aluminium (Figure 1) is a silvery-white lightweight metal and the most abundant metal in the Earth's crust. Because of its late discovery and complicated method of production it is also called the metal of the modern age. Pure aluminium is very shiny and soft. Even small amounts of alloying elements on the surface will turn it grey and harder. Aluminium is a good electrical and thermal conductor. Because it is lighter than copper, its conductivity per unit mass is even better than copper. It is remarkable for its resistance to air and oxidising agents because it forms a thin yet dense protective oxide layer which becomes even thinner as the purity of aluminium increases. Aluminium is also highly resistant to organic acids, making it ideal for applications in food industry.

The global production of primary aluminium in 2018 stood at 64.336 million tonnes and has increased by 22 % in the last 10 years, of which more than half was contributed by China. The production of secondary aluminium is estimated at 25 to 30 million tonnes. By 2050, the EU is predicting to increase its

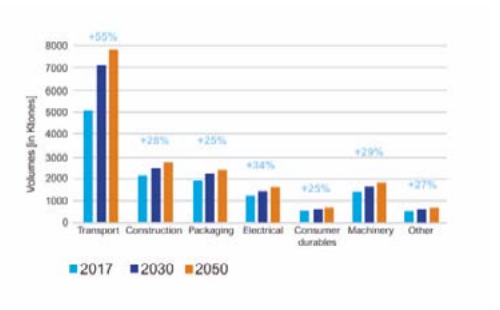


Figure 2: Projected increase in aluminum consumption in the EU by 2050 (source: https://www.european-aluminium.eu)

aluminum consumption by 40 % to 18 mil. t (Figure 2).

The total aluminium production in Slovenia in 2019 stood at 443.656 tonnes (a total of 360,244 t). Compared to year 2014 (360,244 t in total), production increased by 23 %.

Aluminium and its alloys are fully recyclable, making aluminium one of the most environmentally friendly materials. Primary aluminium is mainly used in electrical industry and in applications which do not require high tensile strength but rather good forming properties and corrosion resistance. Aluminium alloys are divided into eight groups with regard to their basic alloying element. Aluminium-based composites (AMC) are reinforced with ceramic or polymer fibres,

or particles and nanoparticles, and have improved mechanical characteristics and exhibit good ductility. They are used for special applications in automotive and aviation industries. Aluminium foams are metal foams and are used for various purposes, such as energy absorbers in case of car crashes, and recently also for medical prostheses.

Aluminum and its alloys are fully recyclable (Figure 3), therefore aluminum is an environmentally friendly material. It can be re-melted and reused without any significant losses. Energy consumption during the recycling process is low at only 5–10 % of the energy used in the production of primary aluminium, which makes aluminium an excellent energy reservoir. If properly treated and sorted prior to recycling, aluminium scrap can be used for almost all applications, while conserving natural resources and saving on energy.

Figure 3: Aluminium is an environmentally friendly material as it is fully recyclable.

The processing of secondary aluminium consists of preparation of raw material, sorting, melting, alloying, treatment of the melt, cleaning of the melt, and casting. In the preparation phase, the material is crushed and degreased, dross milled and sieved out, sheet and foil are fagotted, while mechanically attached iron parts are removed in drain furnaces. With 11 kg of recycled aluminium per capita, Europe is global leader in aluminium recycling, followed by North America with 9.5 kg of recycled aluminium per capita, China with just over 6 kg, and Latin America with just over 2 kg. The global average stands at 4 kg of recycled aluminium per capita.

In the EU, aluminium is used in five key strategic applications, namely mobility, construction, packaging, technology, and general applications (Figure 4). Its expected lifespan (40 years in construction, a few months for packaging) allows for easier planning with regard to the quantity and structure of secondary aluminium. On the EU level, a concrete contribution to circular economy has already been achieved, namely 71.3 % of waste beer cans are recycled, which means that 7 out of 10 cans are returned to recycling plants. Furthermore, more than 90 % by weight of aluminium car parts are recycled as well.

The use of aluminium alloys in the automotive industry is increasing. An average car today contains approximately 210 kg of aluminium alloys. Automobile parts made of aluminium alloys reduce the vehicle's total weight, and consequently also fuel consumption and CO2 emissions. Reduced vehicle weight also improves safety, driving performance and increases comfort. Another large consumer of aluminium is the construction industry. The construction sector uses primarily aluminium profiles and sheets (26 % by weight), mostly made of primary aluminium and various alloys. The reasons for alumi-

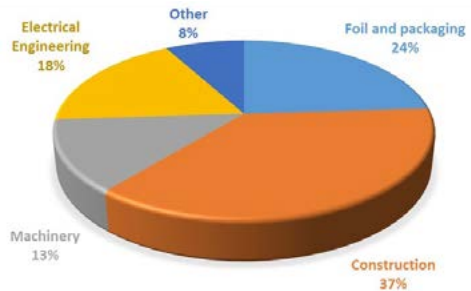


Figure 4: Aluminium alloys consumption ratio per industrial sectors (Source: https://www.world-aluminium.org).

nium's sustainable success in construction industry are its long life cycle, good hardness to mass ration, low maintenance costs and fire safety.

In households and offices aluminium is often applied due to its fashionable design, i.e. in kitchens or for door handles. Aluminium's thermal properties are the deciding factor for its use in the production of household appliances, such as irons or cooking pots and pans. Aluminium is an important material in packaging industry because it provides adequate protection and simple conservation of various products, such as non-alcoholic beverages, soaps, food, tobacco, chocolate, frozen foods, and medicines. Aluminium packaging has become part of our everyday life, as it is highly corrosion resistant. It is a hygienic and non-toxic packaging material for sensitive products, such as drugs and food, and maintains the product's flavour. Because of good electrical and thermal properties of aluminium alloys, aluminium is used for electrical and thermal purposes. Almost all electrical lights, engines and devices use aluminium wire. On a global scale, the majority of high-voltage power lines, distribution lines and underground lines are made of aluminium. Aluminium is also used in steel industry for steel deoxidation, which prevents steel to become brittle and improves its resistance to low temperatures.

Slovenia has a strong potential in advanced metallic materials, particularly in technologically developed companies with their own research departments. This was shown at the the exhibiton »The Song of Metal« which took place in National Museum of Slovenia from December 2018 to August 2019. The exhibition is being continued and takes place at NTF-OMM at Lepe pot 11 (Figure 5). In their pursuit of reindustrialisation, both the EU and Slovenia have identified metallurgy as one of the key strategic areas and one of the strongest technology sectors with a great development potential. The biggest development drivers in aluminium industry today are automotive and aerospace industries, while aluminium alloys have a huge potential in a wide spectrum of other applications, too, such as medicine, pharmacy, military industry, and interior fittings and furnishings. The Automotive industry in particular has set itself the target to develop new high--strength and corrosion resistant aluminium alloys that would combine 100 % recyclability, low weight and high load capacity and hence reduce the volume of components while still provide safety through energy absorption. Due to the enormous potential of additive technologies, such as 3D printing, future activities should be more oriented towards developing new aluminium materials and powder production technologies, as well as other semi-finished products for such purposes. New aluminium alloys for most demanding applications in aerospace industry include micro-alloyed aluminium alloys containing combinations of Mo, Sc, Zr and Er. An important focus area is also the development of alloys and technologies for

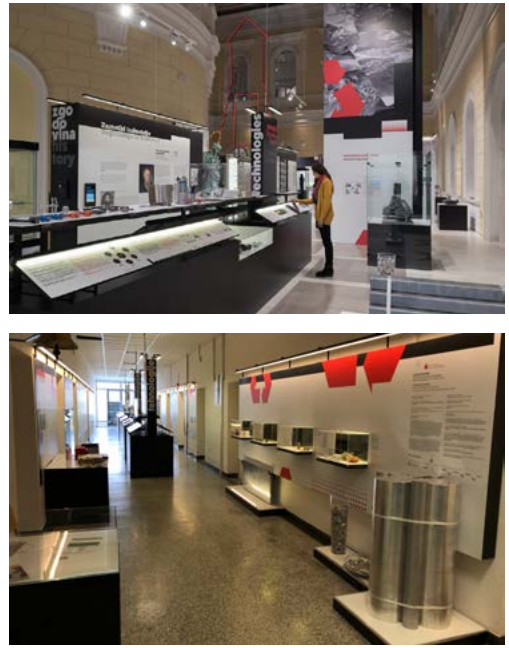


Figure 5: The exhibition »The Song of Metal« presents the importance of metals in Slovenia (Photo: NTF--OMM Archive).

the production of crash-resistant profiles for the automotive industry.

The other two steps for the production of ultra-pure aluminium alloys with high mechanical properties and good corrosion resistance are the introduction of new and the improvement of old technologies, such as alloying processes, melt refining, treatment with miniaturising and modification agents, and the appropriate coagulation and thermo mechanical treatment process. The perspective of primary aluminium production is an environmentally friendly process that uses green inert anodes where the electrolytic cell, apart from aluminium, produces oxygen and thus uses 20 % less energy. With rapid solidification technologies, properly run extrusion procedures and an appropriate chemical composition, make it possible to achieve excellent corrosion and mechanical properties. An important part of the alloying process is heat treatment, that can prove to be very complex in the case of precipitation of two- or multi-phase particles. To achieve the appropriate size of microstructural elements of an alloy and thus the best mechanical properties, the type and ratio of grain refiners and modification agents, as well as temperature and treatment time must be optimised.

Of course, modern development of materials and technologies is not conceivable without modern research work in well-equipped laboratories (some of the NTF- OMM equipment is shown in Figure 6). It is also necessary to establish knowledge transfer from scientific research institutions to industry. Therefore, it is urgent to establish a Slovenian pilot center for advanced solidification technologies of light metals - SiPCAST.

Figure 6: Research equipment in NTF-OMM laboratories (Photo: NTF-OMM Archives).

SODOBNE TEHNOLOGIJE IN GLOBALNI TRENDI V JEKLARSTVU

dr. Jaka Burja in dr. Bojan Podgornik
Inštitut za kovinske materiale in tehnologije

Inovacije jeklarskih procesov so trenutno odločilni dejavnik, ki vpliva in dviga konkurenčno sposobnost evropske metalurgije na svetovnem trgu. Kateri pa so glavni trendi v tem segmentu in kaj omogoča pripravo in vključevanje na svetovne trge?

Metalurgija ni staromoden segment, kot se večkrat misli. Je v koraku z najnovejšimi tehnološkimi trendi. Trenutno je glavni poudarek na zeleni proizvodnji jekla, kar segmentu jeklarstva omogoča zadovoljevanje okoljskih zahtev in vzdrževanje pritiska regulatornih organov.

Naraščajoče povpraševanje po visokokakovostnih in najzahtevnejših tipih jekel zahteva posebno pozornost pri opremi, kjer digitalizacija postaja sestavni del vseh proizvodnih faz. Pogled v prihodnost kaže, da se bo jeklo proizvajalo trajnostno, brez ogljika, varno ter z izjemno visoko stopnjo tehnološkega znanja. To bo privedlo do razvoja jekel z lastnostmi, ki si jih trenutno še težko predstavljamo.

Poglejmo si najprej ekološki vidik vodika proti ogljiku. Potreba po prehodu na zeleno proizvodnjo jekla je že dolgo poudarjena, kar pomeni, da mora proizvodni postopek postati prijaznejši okolju. Obstaja več možnosti. Prvi, ki je okolju najprijaznejši, je prehod z ogljika na vodik pri redukciji železove rude. Sredstva za redukcijo železovih oksidov je moč na različne načine nadomestiti z vodikom. Odločitev za direktno redukcijo na osnovi vodika, ki omogoča uporabo katerekoli železove rude, lahko pri proizvodnji železa praktično eliminira ogljični odtis. Emisije ogljikovega dioksida bodo zanemarljive, blizu nič. Stranske proizvode bo moč obdelati, sami proizvodni procesi pa bodo potekali ob maksimalni energetski učinkovitosti. Metalurški giganti, kot so ArcelorMittal, Voestalpine, SSAB, Dillinger in drugi so že začeli z razvojem teh tehnologij. Japonski Nippon Steel pa se je obvezal, da do leta 2025 preide z ogljične na tehnologijo na osnovi vodika. Zahtevana industrijska oprema še ni na razpolago, je pa razvoj na tem področju zelo spodbuden. Pričakuje se, da bodo prve pilotne proizvodnje zagnane konec leta 2021.

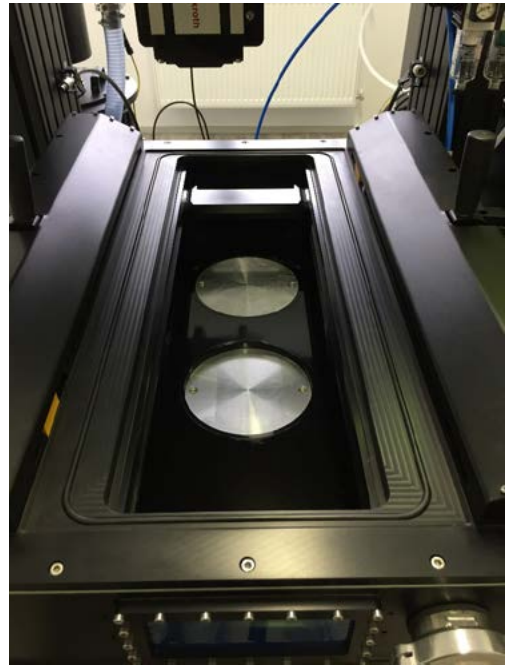
Druga zelena smer, ki se v jeklarstvu že dolgo uporablja, je zmanjšanje vmesnih faz in uporabe »polizdelkov« pri izdelavi jekla preko uporabe surovin z visoko vsebnostjo železa in posebnih tehnologij, kot so Midrex, Arex, Hyl itd.. T. i. metalizirane

Najsodobnejša elektronska mikroskopa (SEM, TEM), ki omogočata vpogled v mikrostrukturo kovinskih materialov vse do atomskega nivoja.

surovine, kot so vroče briketirano železo (Hot-Briquetted Iron - HBI), metalizirani peleti iz direktno reduciranega železa (Direct Reduced Iron – DRI) in železova goba (sponge Iron), se proizvajajo na tak način. To so kovinski proizvodi z visoko vsebnostjo železa (do 99 %), ki jih je moč neposredno uporabiti v jeklarskih postopkih. Take surovine so glavne vhodne komponente za proizvodnjo visokokvalitetne elektro pločevine, kjer nadomeščajo odpadno železo, predvsem zaradi nizke vsebnosti oligoelementov. Ta tehnologija je bila razvita že pred več kot tridesetimi leti in njena učinkovitost do določene mere tudi dokazana. Ker pa ta tehnologija zahteva zelo čisto rudo, z visoko vsebnostjo železa in nizko vsebnostjo nečistoč, kakor tudi velike proizvodne zmogljivosti, so take proizvodne linije locirane zgolj v Braziliji in Avstraliji, blizu rudnikov s kvalitetno rudo ter na Bližnjem vzhodu z ogormnimi količinami plina, ki omogoča poceni pridobivanje železa iz železove rude. Danes tehnologija direktne redukcije železa postaja ena vodilnih tehnologij v metalurgiji.

Ko govorimo o modernih jeklarskih tehnologijah, so ključni kisikovi konvertorji (Basic Oxygen Furnace - BOF) in postopki elektrojeklarstva (elektroobločne peči) ter agregati za sekundarno obdelavo taline. Dandanes se v kisikovih konvertorjih proizvede približno 70 % jekla in 25-30 % v elektroobločnih pečeh. Proizvodnja jekla s kisikovim konvertorjem zahteva uporabo grodlja in proizvede veliko ogljikovega dioksida, pri elektroobločnih pečeh pa se uporablja reciklaža starega železa. Delež recikliranega jekla, torej delež jekla, pridobljenega z elektroobločno pečjo, se v zahodnem svetu povečuje. Pri sekundarni obdelavi taline je uporaba vakuuma ključna za izdelavo modernih jekel. Postopki vakuumiranja taline omogočajo visoke izkoristke legirnih elementov ter nizke vsebnosti plinov v jeklih, kar povezujemo z visoko čistostjo in preprečevanjem jeklarskih napak, povezanih z vodikom in ostalimi plini. Za najzahtevnejše aplikacije jekla obdelujemo še s specialnimi postopki, kot so vakuumsko indukcijsko pretaljevanje (VIM), elektropretaljevanje pod žlindro (EPŽ) in pretaljevanje pod vakuumom (VAR).

Naslednja stopnja pri prehodu v zeleno in trajnostno proizvodnjo jekla je kombinacija postopkov taljenja in preoblikovanja brez vmesnega hlajenja in ogrevanja. Teh je vedno več in se tudi vse širše uporabljajo. Sestojijo iz talilnega agregata, priprave taline in stroja za kontinuirano litje, čemur sledi direktno valjanje. Dandanes se gradijo modularne procesne linije, kar dovoljuje prihranek prostora, zmanjšanje logističnih stroškov in časa proizvodnje. Takšni moduli so že dobro poznani, pri čemer pa ne vključujejo le taljenja, vlivanja in vročega valjanja, temveč tudi že hladno valjanje,



Laboratorijski 3D tiskalnik kovinskih materialov s selektivnim laserskim taljenjem (SLM) z možnostjo ogrevanja podlage.

vlečenje itd., torej večje stopnje predelave.

Posebno in zelo pomembno področje v metalurgiji predstavljajo visokotrdnostna jekla (termomehansko obdelana, poboljšana, dvofazna, kaljena med preoblikovanjem itd.) oziroma prehod s konvencionalnih konstrukcijskih v visokotrdnostne skupine jekel. Ta jekla zaradi postopkov izdelave običajno dosegajo visoke mehanske lastnosti, saj so lahko po kemijski sestavi podobna običajnim konstrukcijskim jeklom. To je še posebej opazno v avtomobilski industriji, kjer vedno strožji varnostni standardi, zahteve po zmanjševanju porabe in vpeljava električnih avtomobilov zahtevajo razvoj lažjih, okolju prijaznejših in varnejših avtomobilov. Visokotrdnostna jekla (High Strength Steel - HSS) in napredna visokotrdnostna jekla (Advanced High Strength Steel - AHSS) v zadnjih desetih letih vse bolj nadomeščajo svoje mehkejše predhodnike, in to v zelo širokem spektru. Tipičen sodoben avtomobil tako vsebuje že preko 30 % HSS in do 30 % AHSS, z izrazitim trendom zmanjševanja deleža mehkega nizkoogljičnega, nizkolegiranega jekla.

Digitalizacija in digitalne tehnologije predstavljajo še eno pomembno področje sodobne metalurgije. Vsa moderna metalurška postrojenja so popolnoma avtomatizirana, uporaba robotov pa se pričakuje v vseh nevarnih delovnih conah. Ob tem nadzorni sistemi stanja (State Monitoring System - SMS) in razširjena resničnost (Augmented Reality - AR) olajšajo kontrolo, nadzor, načrtovanje in vzdrževanje. Optimizacija procesov pa bo temeljila na uporabi umetne inteligence, kar naj bi omogočilo preprečevanje pojava napak. Poleg vpeljave novih razvojnih tehnologij in inovacij so pomembne tudi prenove, nadgradnje in izboljšave že obstoječih, kar omogoča vzdrževanje konkurenčnosti, kakovosti in pozitivnega odnosa do okolja. To vključuje obnovo in rekonstrukcijo obstoječih postrojenj z vpeljavo inovativnih rešitev, kot so sistemi za čiščenje, aspiracijski sistemi, rekuperatorji itd..

Najsodobnejša oprema za mehansko testiranje kovinskih materialov pri sobni in povišani temperaturi.

MODERN TECHNOLOGIES AND GLOBAL TRENDS IN THE STEEL MAKING INDUSTRY

dr. Jaka Burja and dr. Bojan Podgornik
Institute of Metals and Technology

Innovation in steel making processes is currently a decisive factor that influences and raises the competitiveness of European metallurgy in the global market. What are the main trends in this segment and what enables the integration into the global markets?

Metallurgy is not an old-fashioned segment as it is most oftenly perceived. It is very well aligned with the latest technological trends. Currently, the main focus is on “green steel production”, which allows the steel making segment to meet environmental requirements and to withstand the regulatory pressure. The growing demand for high-quality and most demanding types of steels requires special attention to equipment, where digitization is becoming an integral part of all production phases. Looking to the future, steel will be produced sustainably, without carbon, safely and with an extremely high level of technological know-how. This will lead to the development of steels with yet unthinkable properties.

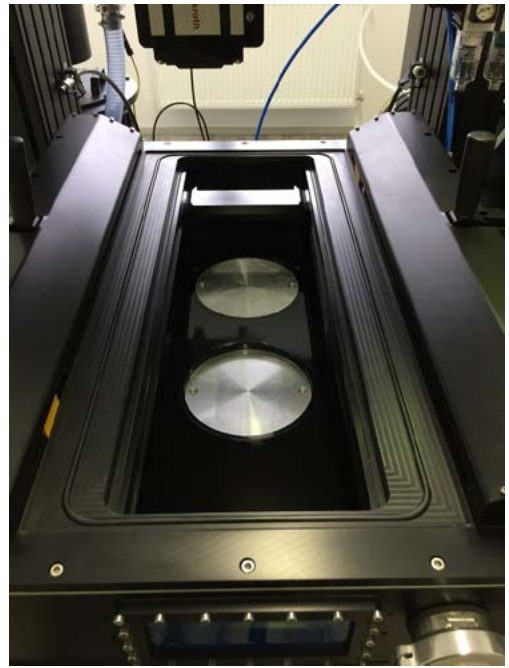
Let’s look at the ecological aspect – hydrogen versus carbon. The need to switch to "green steel production" has long been emphasized, meaning that the production process must become more environmentally friendly. The first option, which is the most environmentally friendly, is the transition from carbon to hydrogen in the reduction of iron ore. In various ways Iron oxide reducing agents can be replaced with hydrogen. The decision for direct hydrogen-based reduction, which allows the use of any iron ore, can virtually eliminate the carbon footprint in iron production. Carbon dioxide emissions will be negligible and very close to zero. By-products will also be processed, and the production processes themselves will be achieved with maximal energy efficiency. Metallurgical giants such as ArcelorMittal, Voestalpine, SSAB, Dillinger and others have already begun developing these technologies. Japan’s Nippon Steel, however, has committed to switching from carbon to hydrogen-based technology by 2025. The required industrial equipment is not yet available, but developments in this area are very encouraging. The first pilot production is expected to start at the end of 2021.

State-of-the-art electron microscopes (SEM, TEM), which provide insight into the microstructure of metallic materials all the way to the atomic level.

Another "green" direction that has long been used in the steel making industry is the reduction of intermediate stages and the use of "semi-finished products" through the use of raw materials with high iron content and special technologies such as Midrex, Arex, Hyl, etc. So-called metallized raw materials, such as Hot-Briquetted Iron (HBI), Direct Reduced Iron (DRI) metallized pellets and sponge Iron, are produced in this way. These are metal products with a high iron content (up to 99%) that can be used directly in steel making processes. Such raw materials are the main input components for the production of high-quality electrical sheet metal, where they replace scrap iron, mainly due to the low content of trace elements. This technology was developed more than 30 years ago and its effectiveness has also been to some extent proven. However, as this technology requires very clean ore, high in iron and low in impurities, as well as high production capacity, such production lines are located only in Brazil and Australia, close to quality ore mines and in the Middle East, with huge amounts of gas which allows cheap extraction of iron from iron ore. Today, direct iron reduction technology is becoming one of the leading technologies in metallurgy.

Talking about modern steel making technologies, the key elements are oxygen converters (Basic Oxygen Furnace - BOF) and electrical steelmaking processes (electro-arc furnaces) and units for secondary processing of the melt. Today, about 70% of steel is produced in oxygen converters and 25-30% in electric arc furnaces. The production of steel with an oxygen converter requires the use of pig iron and produces large amounts of carbon dioxide, while electric arc furnaces use scrap iron recycling. In the western world the share of recycled steel, i.e. the share of steel obtained by electric arc furnace, is increasing. For the production of modern steels in secondary melt processing the use of vacuum conditions is crucial. Melt evacuation processes enable high efficiencies of alloying elements and low gas contents in steels, which is associated with high purity and prevention of steel defects related to hydrogen and other gases. For the most demanding steel applications, special processing procedures, such as vacuum induction remelting (VIM), electric remelting under slag (EPŽ) and remelting in vacuum (VAR) is used.

The next step in the transition to green and sustainable steel production is a combination of melting and forming processes without intermediate cooling and heating. Recently such technologies are is being widely used. They consist of a melting unit, a melt preparation machine and a continuous casting machine, followed by direct rolling. Today, modular process lines are



Laboratory dedicated 3D printer of metallic materials with selective laser melting (SLM) with possibility of substrate preheating.

being built, which saves space, reduces logistics costs and production time. Such modules are already well known, and include not only melting, casting and hot rolling, but also higher processing stages such as cold rolling, drawing, etc.

A special and very important field in metallurgy is represented by high-strength steels (thermomechanically treated, improved, two-phase, hardened during transformation, etc.) or transition from conventional structural to high-strength steel groups. These steels tend to achieve high mechanical properties due to manufacturing processes, as they can be chemically similar to conventional structural steels. safer cars. High Strength Steel (HSS) and Advanced High Strength Steel (AHSS) have increasingly replaced their softer predecessors over the last ten years. A typical modern car thus already contains over 30% HSS and up to 30% AHSS, with a pronounced downward trend in the share of "soft" low-carbon, low-alloy steel.

Digitization and digital technologies represent another important field of modern metallurgy. All modern metallurgical plants are fully automated, and the use of robots is expected in all hazardous work zones. In addition, the State Monitoring System (SMS) and Augmented Reality (AR) facilitate control, monitoring, planning and maintenance. Process optimization will be based on the use of artificial intelligence, which should prevent the occurrence of errors. In addition to the introduction of new development technologies and innovations,

State-of-the-art equipment for mechanical testing of metallic materials at room and elevated temperatures.

renovations, upgrades and improvements of existing ones are also important, which enables the maintenance of competitiveness, quality and a positive attitude towards the environment. This includes the renovation and reconstruction of existing plants with the introduction of innovative solutions such as cleaning systems, aspiration systems, recuperators, etc.

POLIMERI IN POLIMERNE TEHNOLOGIJE PRIHODNOSTI

dr. Blaž Nardin

Fakulteta za tehnologijo polimerov

Polimerni materiali izvirajo z začetka 20. stoletja in so doživeli nesluten razvoj, ki mu ni videti konca. Predvideva se, da bo proizvodnja polimernih materialov in njihovih aplikacij do leta 2035 zrasla s 322 na 650 milijonov ton na leto. To pomeni podvojitev proizvodnje in re-uporabe materialov, razvoj novih tehnologij in orodij. Predvsem pa to pomeni izjemen izziv za varovanje našega planeta kot zelenega doma, ki so nam ga podarili naši starši in ga moramo ohraniti za naše otroke.

Fakulteta za tehnologijo polimerov (FTPO) je samostojen visokošolski zavod, ki je bil ustanovljen na iniciativo podjetij, ki tovrstne kadre potrebujejo. V Sloveniji deluje na področju predelave polimerov več kot 1700 podjetij. Prihajajo iz avtomobilske industrije, industrije bele tehnike, zabavne industrije, medicine, farmacije, aeronavtike,... Ni ga področja, na katerega se znanja, pridobljenega na Fakulteti za tehnologijo polimerov, ne bi dalo aplicirati.

Delo na FTPO temelji na treh stebrih (izobraževanje, raziskave in delo z industrijo), ki se med seboj dopolnjujejo. Vsi so usmerjeni v razvoj materialov in tehnologij prihodnosti. Skupaj s partnerji obvladujemo ključne trende pri razvoju tehnologij in materialov ter skrbi za okolje.

Na področju razvoja tehnologij in orodij obvladujemo napredna 3D modeliranja polimernih izdelkov in orodij ter potrebne simulacijske tehnike in tehnologije tako na področju reoloških simulacij kot tudi na področju strukturnih analiz. Tako imajo izdelki in materiali t .i. tehnološki potni list za hitro aplikacijo v realnem življenju. V prihodnosti se bomo osredotočili na razvoj novih inovativnih tehnologij predelave plastičnih materialov (predvsem ekstruzije in brizganja) za doseganje zahtevnih tolerančnih lastnosti izdelkov iz recikliranih in regeneriranih materialov. To predstavlja velik izziv, saj je potrebno za to, da zadostimo zahtevam izdelkov, pri regeneriranih in recikliranih materialih poznati mehanske in termične karakteristike osnovnih in recikliranih/regeneriranih materialov. Zato bo ključnega pomena, da bomo znali avtomatsko napovedovati kakovostne parametre neposredno iz procesnih parametrov. Za to so potrebna nova orodja in senzorji, ki bodo za ustrezno kakovost materiala, ki ga procesiramo, s pomočjo umetne inteligence in baze podatkov skrbeli »on-line«. Za vse regenerirane in reciklirane materiale je potrebno predhodno izvesti tako mehansko (statično in dinamično) kakor tudi termično in reološko karakterizacijo. V povezavi s smernicami Industrije 4.0 in smernicami pametne specializacije se dodatno ukvarjamo z digitalizacijo izdelovalnih postopkov, ki sloni predvsem na 3D digitalizaciji, kakor tudi na različnih aditivnih tehnologijah (FFF, SLS in DLP). Na področju krožnega gospodarstva so ključna področja razvoja na »up-cyclingu« termoplastičnih regeneratov in reciklatov in skrbi za razvoj tehnologij reciklaže duroplastičnih kompozitov. V povezavi z razvojem bioosnovanih in biorazgradljivih materialov predstavlja študij kompostibilnosti posebno področje, ki bo v prihodnosti imelo vse večji pomen.

Razvoj tehnologij je neposredno povezan z razvojem materialov, ki se uporabljajo v različnih aplikacijah, od embalažnih materialov, materialov za visoko zahtevne aplikacije v aeronavtiki, kakor tudi materialov,

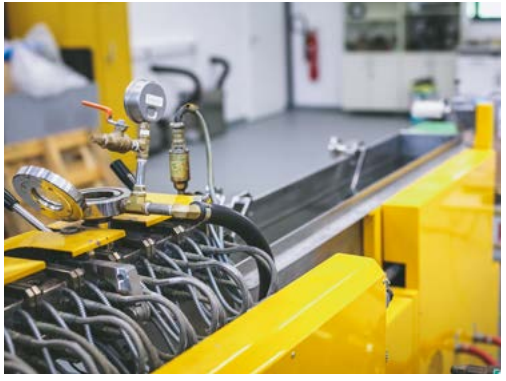
ki se uporabljajo v medicini. Ti so večinoma osnovani kot različni večkomponenti materiali, osnovani tako na duroplastičnih kot tudi na termoplastičnih matricah. Pri večkomponentnih materialih stremimo predvsem k izboljšanju haptičnih lastnosti osnovnih materialov, kakor tudi k izboljšanju mehanskih in triboloških lastnosti. Posebno področje predstavlja razvoj materialov za aditivne tehnologije (FFF, DLP in SLS).

Raziskovalna oprema, ki jo imamo na razpolago, omogoča tudi sintezo različnih (bio) osnovanih materialov. Pri tem so ključnega pomena predvsem raziskave in razvoj na področju fenolnih smol na bioosnovi, sintezi na ligninski osnovi, kakor tudi sinteza monomerov iz razgradnih produktov celuloze.

Z razvojem polimernih tehnologij in materialov bomo omogočili, da bodo slovenska podjetja ostala dolgoročno konkurenčna in da bodo na posameznih področjih imela konkurenčno prednost. Pri tem ne smemo pozabiti izobraževalne vloge, ki jo ima FTPO kot edina izobraževalna institucija v Sloveniji na področju tehnologije polimerov. Tega se zelo zavedamo in skrbimo za razvoj novih inovativnih metod poučevanja, ki bodo omogočale tako osnovno študijsko aktivnost kakor tudi prilagojene aktivnosti za potrebe usposabljanj v podjetjih.

Praktično delo študentov na stroju za brizganje plastike

Laboratorijski mešalni reaktor za sintezo polimerov



Dvopolžni ekstruder

Dinamična mehanska analiza

POLYMERS AND POLYMER TECHNOLOGY OF THE FUTURE

dr. Blaž Nardin

Faculty of Polymer Tehcnology

Polymeric materials have undergone an unimaginable development since the beginning of the 20th century, with no end in sight. The production of polymeric materials and their applications is expected to increase from 322 to 650 million tonnes per year by 2035. This means a doubling of the production and reuse of materials, the development of new technologies and tools. This increases the awareness and challenge to protect our planet, as a green home given to us by our parents and which we must give to our children.

Faculty Polymer Technology is an independent higher education institution established on the initiative of industry, where such experts are needed. In Slovenia, more than 1,700 companies are active in the field of polymer technology. They are active in the automotive industry, household appliances, entertainment, medicine, pharmaceuticals, aviation, etc. There is not a single area where the knowledge acquired at the Faculty of Polymer Technology cannot be applied.

The work at FTPO is based on three pillars (education, research, and industrial work) that support each other and point in the direction of the development of future materials and technologies. Together with partners, we master the key trends in materials and technology development, with a focus on environmental protection.

In the field of technologies and moulds, FTPO masters advanced 3D modelling of polymer products and moulds needed for injection moulding and structural simulation. With such an approach, the developed products can obtain a "technology passport" for rapid and reliable application in the market. In the future, we will focus our work on the development of new innovative plastic processing technologies (mainly extrusion and injection moulding) to achieve narrow tolerance fields using regenerated and recycled materials. This is a major challenge as it is necessary to understand the regenerates and recyclates in terms of mechanical and thermal properties of both the original matrix and the recyclates/recycled materials. For this it is important that it is possible to automatically predict quality parameters directly from the processing. To do this, new sensors and tools need to be developed to use artificial intelligence and the material database to monitor processing quality online. For all regenerated and recycled materials, it is necessary to perform characterization - mechanical (static & dynamic), as well as thermal and rheological. In connexion with the guidelines of industry 4.0, the guidelines of smart specialisations, additionally the digitalization of the manufacturing processes must take place. These are in the field of 3D digitization, as well as in the field of additive technologies (FFF, SLS, DLP). The challenges of the Circular Economy are directly linked to the "upcycling" of thermoplastic regenerates and recyclates as well as thermoset composites. In connexion with the (bio) based and (bio)degradable materials, the study of compostability is a special field of increasing importance.

The development of new technologies is directly related to the development of materials used in various applications, such as packaging, highly stressed aerospace

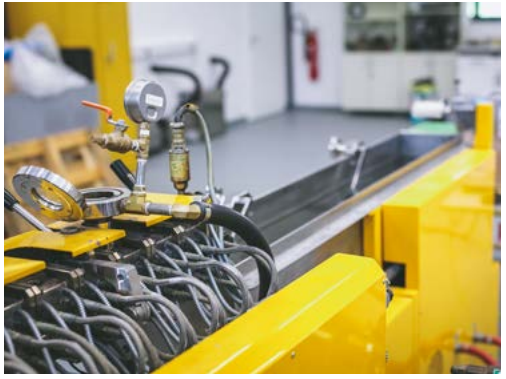
applications, medicine. Such materials are in many cases developed as multicomponent materials based on a thermoset or thermoplastic matrix. With the development of multi-component materials, we aim to improve various material properties such as haptics, mechanics, thermics or tribology. A special field is the development of materials for additive technologies (FFF, DLP & SLS).

The research equipment located at FTPO enables the investigation of different syntheses of (bio-)materials. A particular focus is on the research & development of bio-based phenolic resins, the synthesis of lignin-based materials and the synthesis of monomers from degradable cellulose products.

The development of polymer technologies and materials enables Slovenian companies to maintain their competitiveness and market-leading positions in selected fields. The importance of the educational function should not be forgotten, as FTPO is the only institution that provides accredited education in the field of polymer technologies. With the development of new and innovative teaching methods, we will increase both the knowledge of our students and the process of lifelong learning in companies.

Practical work of students on the injection moulding machine

Laboratory mixing reactor for polymer synthesis



Twin-screw extruder

Dynamic mechanical analysis

MULTIKOMPONENTNI MATERIALI PRIHODNOSTI SO EDEN OD KLJUČEV DO TRAJNOSTNE PROIZVODNJE IN POTROŠNJE

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Kemijski inštitut, Odsek za polimerno kemijo in tehnologijo

Nekovinski multikomponentni materiali predstavljajo širok nabor materialov, ki so že dolgo uveljavljeni v številnih izdelkih. Mednje prištevamo vse kombinacije materialov, ki jih opredeljuje polimerna matrika, od z vlakni ojačenih kompozitov preko polnjenih plastik kot tehničnih izdelkov do tkanin in premazov. Skupno vsem tem raznolikim materialom je, da smiselno združujejo različne komponente in omogočajo lastnosti, ki presegajo lastnosti alternativnih materialov. Primer so z vlakni ojačeni kompoziti, ki dosegajo odlične mehanske lastnosti, so cenovno ugodni in omogočajo enostavno in učinkovito proizvodnjo.

Multikomponentni materiali so poznani že relativno dolgo, vendar doživljajo hiter napredek, ker je število kombinacij različnih vhodnih materialov skoraj neomejeno. To pomeni, da v prihodnosti lahko pričakujemo številne nove materiale, ki bodo nadalje širili uporabnost in količine v uporabi.

Razvoj multikomponentnih materialov ima danes dva glavna poudarka: izboljšave okoljskih vidikov in razvoj funkcionalnih lastnosti. Za tržno uspešnost je seveda nujna tudi cenovna učinkovitost, ki zajema praktične vidike, kot je dostopnost surovin oziroma posamičnih komponent, način proizvodnje, poraba energije, avtomatizacija ipd..

Okoljski izzivi

Plastika in umetni polimerni materiali (P&P) so v zadnjem času zaradi onesnaževanja okolice pod relativno močnim pritiskom. Vse študije kažejo, da so polimerni odpadki prisotni v skoraj vseh, tudi najbolj oddaljenih okoljih, kjer zelo počasi razpadajo in kot trajni tujki v okolju povzročajo različne posledice.[1] Najbolj kritični so negativni učinki na organizme in ekosistem, v študijah pa poskušajo ugotoviti tudi, kakšen je vpliv na človeka.[2] Ker gre za dolgotrajno izpostavljenost nizkim koncentracijam različnih polimernih materialov, je te učinke zelo težko jasno in natančno opredeliti.

Posledično se je spremenila tudi javna podoba P&P, ki je razcepljena. Po eni strani uporaba teh materialov še vedno močno narašča, saj vstopajo v nova področja uporabe, kar kaže na izjemno uporabnost in veliko sprejemanje polimernih materialov s strani uporabnikov. Po drugi strani se krepijo pozivi za zmanjšanje uporabe, predvsem pa za nove pristope k zmanjševanju izpustov P&P v okolje. Kritike in pozivi k omejitvam prihajajo tudi kot posledica debat o odzivih na podnebne spremembe. Velika večina P&P temelji na neobnovljivih surovinah in tako prispeva k ogljičnemu odtisu družbe. Kritike in tovrtsne skrbi so že nekaj časa vključene v snovanje novih politik, pri čemer so članice Evropske unije med vodilnimi pobudniki sprememb. Prihodnost P&P materialov in s tem tudi multikomponentnih materialov nakazujejo operativni dokumenti, kot je npr. »Plastična strategija«,[3] Direktiva o izdelkih za enkratno uporabo[4] kot tudi Evropski zeleni dogovor,[5] ki v glavnih poudarkih jasno kažejo pomen okoljskih ciljev.

Na pritisk se vedno bolj odzivajo tudi potrošniki in industrija. Najbolj akutno je stanje glede izpusta odpadkov v okolje, kar se naslavlja z razvojem organizacije in tehnologij ravnanja z odpadki. Povečanje

recikliranja je najbolj neposreden ukrep, ki pa hitro zahteva nove tehnološke rešitve. Predvsem težavni za recikliranje so moderni multikomponentni materiali, ker takšni materiali združujejo več komponent. Primer so ojačeni kompoziti, kjer so združeni zamreženi polimeri in različni ojačitveni dodatki. S trenutnimi rešitvami jih je težko učinkovito reciklirati, še posebej na način, ki ohranja ali izboljšuje njihove lastnosti. Na tem področju zato potekajo aktivne raziskave, ki v veliki meri prehajajo od mehanskega recikliranja v kemijsko recikliranje, pri katerem polimerno matrico razgradimo v osnovne gradnike ali derivate le-teh in te kot surovino ponovno uporabimo pri pripravi polimerov. Na ta način ohranjamo kvaliteto materialov, koristno uporabimo odpadke in ohranjamo vire v daljši in večkratni uporabi. Tovrstni postopki so še v razvoju za relativno pogoste materiale, kot so poliamidi ali poliuretani [6] in se šele uveljavljajo za tako pogost material, kot je npr. polietilentereftalat.[7] Postopno uvajanje novih tehnologij reciklaže bo omogočalo učinkovitejše recikliranje brez poslabševanja lastnosti v zaporednih uporabah, kar hitro pripelje do energijske izrabe kot edine smiselne uporabe. V kombinaciji z avtomatskimi sortirnimi metodami se bosta recikliranje in tudi vrednost polimernih odpadkov povečala. Rezultat bo zmanjšanje izpustov v okolje ter večja izraba vloženih virov, vključno z energijo.

(Ne)obnovljiva narava polimernih materialov

Izboljšave v recikliranju in višja učinkovitost pa niso odgovor za uporabo neobnovljivih virov. Znaten del raziskovalnih naporov je zato usmerjen v razvoj polimerov in surovin za izdelavo polimerov iz obnovljivih virov. Prevladujoče mnenje je, da bodo polimeri na osnovi obnovljivih virov – bioosnovani polimeri in biorazgradljivi polimeri - v krajšem obdobju nadomestili samo del konvencionalnih, neobnovljivih polimerov.[8] Za bolj obsežno nadomeščanje konvencionalnih polimerov, ki ga lahko pričakujemo zgolj dolgoročno, pa bo nujna vključitev biotehnoloških postopkov. Razvoj bele biotehnologije, biorafinerij in količinske proizvodnje platformnih obnovljivih gradnikov [9] bo omogočal opustitev fosilnih virov za proizvodnjo polimerov. V prvi fazi tega razvoja gre predvsem za nadomeščanje znanih gradnikov, ki jih tradicionalno pridobivamo iz fosilnih virov, z enakimi, pridobljenimi iz obnovljivih virov. Na takšen način lahko povečujemo delež obnovljivega ogljika v polimeru in hkrati ostajamo na znanih trgih. Predelava biomase pa vodi tudi do novih spojin, ki jih lahko vgrajujemo v nove polimere. Primer so furanske dikarboksilne kisline, ki lahko zamenjajo tereftalno kislino v sintezi poliestrov ali izosorbid na osnovi enostavnih sladkorjev.[10] Sčasoma lahko na tej osnovi pričakujemo vrsto novih polimerov, ki se bodo vedno bolj oddaljevali od fosilnih virov, hkrati pa ohranjali in razširjali uporabne lastnosti današnjih polimerov.

Nove funkcionalnosti polimernih materialov

Drugo ključno področje razvoja je razvoj novih funkcionalnih materialov. Nove funkcionalnosti lahko izvirajo iz novih polimerov, novih kombinacij in formulacij polimerov ali iz novih struktur. Najbolj pogosto lahko z relativno majhnimi spremembami, na primer z novim komonomerom ali novo sintezno potjo, že znane polimere modificiramo, da dobijo nove uporabne lastnosti, ki jim omogočijo razširitev uporabe. Primer je širjeneje temperaturnega območja uporabe, kar odpira nove aplikacije. Takšen primer je bil razvoj temperaturno obstojnega polilaktida – bioosnovanega, biorazgradljivega materiala - s sintezo, ki zagotavlja kontrolirano stereokemijo. Podobno je mogoče bistveno vplivati na lastnosti polialkanoatov, naravnih termoplastičnih poliestrov

z majhnimi dodatki ko-monomerov ali s pravilno mešanico različnih izomernih polimerov.

Vsem pristopom je skupen natančen nadzor nad kemijsko sestavo in strukturo polimerov, ki se odraža v edinstvenih končnih (makro) lastnostih materiala. V ta trend sodi tudi nadzor nad strukturo in samourejanjem polimerov na nano nivoju v trdnem stanju in raztopinah, kar vodi do samourejenih biomimetičnih sistemov, ki v veliki meri oponašajo naravne materiale. Kompleksnost lesa kot naravnega bioosnovanega, biorazgradljivega ojačenega kompozita ali raznolikost struktur in urejenosti beljakovin je zaenkrat še nedosegljiv cilj, vendar nakazuje smer razvoja pametnih materialov. Takšen razvoj materialov omogočajo napredne metode polimerizacije s kontroliranim mehanizmom, ki vključujejo drugačne katalizatorje, kar pa zahteva vrhunsko znanje in opremljenost na področju polimerne kemije in tehnologij.

Pričakovati je, da bodo v prihodnosti polimerni materiali še bolj uporabni in predvsem okoljsko sprejemljivi materiali. Spremembe se bodo dogajale za uporabnike skoraj neopazno in ne bodo zahtevale odpovedovanj. V ozadju pa se bo v tem procesu dogajala prava revolucija in konkurenčna vojna, ki bo imela nove zmagovalce in poražence. Tu leži tudi izjemen razvojno-raziskovalni izziv, in, kar je morda še bolj pomembno, izziv, kako vrhunske raziskave pretvoriti v gospodarske učinke.

Raziskave in razvoj polimernih materialov na Kemijskem inštitutu

Raziskave na področju polimerov imajo na Kemijskem inštitutu dolgo zgodovino. Tradicionalno potekajo v okviru Odseka za polimerno kemijo in tehnologijo, ki izstopa predvsem po obvladovanju sinteze in karakterizacije polimerov, zaradi aktualnosti polimerov in vedno bolj interdisciplinarnega dela pa se delo s polimeri pojavlja tudi na drugih odsekih inštituta kot tudi v drugih inštitucijah znanja.

Primeri izjemno aktualnih vrhunskih interdisciplinarnih raziskav segajo na področja manipulacije strukture visokoporoznih templatiranih materialov za uporabo kot materialov za čiščenje voda, zajemanje ogljikovega dioksida in kot materialov za uporabo v tkivnem inženirstvu. Raziskave obsegajo tudi pripravo nanokompozitov z izboljšanimi lastnostmi in kemijsko reciklažo, ki je usmerjena v razgradnjo poliamidov in poliuretanskih pen do osnovnih gradnikov kot tudi uporabo novih bioosnovanih gradnikov, kot je levulinska kislina za sintezo polimerov, razvoj posebnih biorazgradljivih polimernih formulacij za embalažo, razvoj katalitskih procesov za ciljane pretvorbe biomase in podobno. Veliko podporo raziskavam nudi raziskovalna infrastruktura inštituta z NMR centrom in vrhunskimi elektronskimi mikroskopi.

Kemijski inštitut že vrsto let vrhunsko raziskovalno delo uspešno povezuje z izobraževanjem kadrov, sodelovanjem v ključnih razvojnih iniciativah, kot so SRIP-i, ter predvsem s sodelovanjem s številnimi partnerji v gospodarstvu.

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Raziskave na področju materialov podpira najsodobnejša raziskovalna oprema

MULTICOMPONENT MATERIALS OF THE FUTURE ARE ONE OF THE KEYS TO A SUSTAINABLE PRODUCTION AND CONSUMPTION

dr. Andrej Kržan and dr. Ema Žagar

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Non-metallic multicomponent materials represent a wide range of materials that are used in many products. These include all combinations of materials defined by a polymer matrix: from fiber-reinforced composites to filled plastics as technical products, to fabrics and coatings. Common to all these diverse materials is that they meaningfully combine different components and allow properties that go beyond the properties of alternative materials. An example are fiber-reinforced composites, which achieve excellent mechanical properties, are affordable and allow easy and efficient production.

Multicomponent materials have been known for a relatively long time but are experiencing rapid progress since the number of combinations of different component materials is almost unlimited. This means that in the future we can expect many new materials that will further expand usability and quantities in use.

The development of multicomponent materials today has two main emphases: improvements in environmental aspects and the development of functional properties. For market success, of course, price efficiency is also necessary, which includes aspects, such as the availability of raw materials or individual components, production methods, energy consumption, automation, etc.

Environmental Challenges

Plastics and artificial polymeric materials (P&P) have recently been under relatively strong pressure due to environmental pollution. All studies show that polymer waste is present in almost all, even the most remote environments, where it decomposes very slowly and, as permanent foreign substances in the environment, causes various negative consequences.[1] The most critical are negative effects on organisms and the ecosystem, and new studies are also trying to determine the impact on humans.[2] Because of the long-term exposure to low concentrations of different polymeric materials, these effects are very difficult to ascertain clearly and accurately.

As a result, the public image of P&P, which is in itself fragmented, has also changed: on the one hand, the use of these materials is still growing strongly as they enter new areas of application. This indicates the exceptional usability and high acceptance of polymeric materials by users. On the other hand, there are growing calls to reduce use, and especially for new approaches to reducing P&P emissions into the environment. Criticism and calls for restrictions also come as a result of debates on responses to climate change as the vast majority of P&P are based on non-renewable raw materials and thus contribute to the societal carbon footprint. Such criticism and concerns are influencing new policies, with European Union member states being among the global leaders in the development of new approaches. The future of P&P materials and thus also multicomponent materials is indicated by operational documents such as e.g. The "Plastic Strategy",[3] the Single Products Directive[4] as well as the European Green Agreement,[5] which clearly highlight the importance of environmental objectives.

Consumers and industry are also increasingly responding to the pressure. The most acute situation is regarding the release of waste into the environment, which is addressed by the development of the organization and technologies of waste management. Increasing recycling is the most direct measure, but it quickly requires new technological solutions. Modern multicomponent materials are particularly difficult to recycle since they combine several components. An example are reinforced composites, where crosslinked polymers and various reinforcing additives are combined. With current solutions, they are difficult to recycle efficiently, especially in a way that preserves or improves the properties of components for reuse. Therefore, active research is underway in this field, which is largely moving from mechanical recycling to chemical recycling, in which the polymer matrix is decomposed into basic building blocks or derivatives thereof and reused as a raw material in the preparation of new polymers. In this way, we maintain the quality of materials, make good use of waste and preserve resources for longer, multiple use. Such processes are still under development for relatively common materials such as polyamides or polyurethanes [6] and are only being established for such a material as widely used as polyethylene terephthalate.[7] The gradual introduction of new recycling technologies will allow for more efficient recycling without deteriorating properties in successive uses which today quickly leads to energy recovery as the only sensible end-of-life option. In combination with automatic sorting methods, recycling as well as the value of polymer waste will increase. The result will be a reduction in emissions into the environment and a greater use of invested resources, including energy.

The (Non)renewable Nature of Polymers

Improvements in recycling and higher efficiency, however, are not the answer to using non-renewable resources. A significant part of the research effort is therefore focused on the development of polymers and raw materials for the production of polymers from renewable sources. The prevailing opinion is that polymers based on renewable sources - bio-based polymers will replace only a part of conventional, non-renewable polymers in a short-term. However, the inclusion of biotechnological processes will be necessary for a more extensive replacement of conventional polymers, which can only be expected in the long run.[8]

The development of white biotechnology, biorefineries and volume production of platform renewable building blocks [9] will make it possible to abandon fossil resources for polymer production. In the first phase of this development, it is mainly a question of replacing the known building blocks, which are traditionally obtained from fossil sources, with the same ones obtained from renewable sources. In this way, we can increase the share of renewable carbon in the polymer and at the same time stay in known markets. Biomass processing also leads to new compounds that can be incorporated into new polymers. Examples are furan dicarboxylic acids, which can replace terephthalic acid in polyester synthesis, or isosorbide based on simple sugars [10]. Over time, on this basis, we can expect a series of new polymers that will move further and further away from fossil resources while preserving and expanding the useful properties of today's polymers.

New Functionalities of Polymer Materials

Another key area of R&D is the development of new functional materials. New functionalities can be derived from new polymers, new combinations and formulations of polymers, or from new structures. Most often, with relatively small changes,

for example the inclusion of a new comonomer or a new synthetic pathway, already known polymers can be modified to obtain new useful properties that allow them to expand their application. An example is broadening the application temperature range which opens up new applications. One such example was the development of a temperature-resistant polylactide - a bio-based, biodegradable material, through a synthesis that provides controlled stereochemistry. Similarly, it is possible to significantly influence the properties of polyalkanoates - natural thermoplastic polyesters with small additions of co-monomers or with the right mixture of different isomeric polymers.

Common to these approaches is the precise control of the chemical composition and structure of polymers, which is reflected in the significantly improved final (macro) properties of the material. This trend also includes control over the structure and self-assembly of polymers at the nano level in solid state and solutions, leading to self-assembled biomimetic systems that largely mimic natural materials. The complexity of wood as a natural bio-based, biodegradable reinforced composite or the diversity of protein structures and arrangements is still an unattainable goal, but it indicates the direction of development for man-made smart materials. Such development of materials is enabled by advanced polymerization methods with a controlled mechanism, which include different catalysts, which requires top knowledge and equipment in the field of polymer chemistry and technologies.

It is expected that in the future, polymeric materials will be even more useful and, above all, environmentally friendly. For the users, these changes will happen almost invisibly and will not require any sacrifices. In the background, however, a real revolution will be taking place as well as a competitive war that will result in winners and losers. This is also an extraordinary R&D challenge and perhaps more importantly, a challenge of how to turn cutting-edge research into economic results.

Polymer Research and Development at the National Institute of Chemistry

Research in the field of polymers has a long history at the Institute of Chemistry. It traditionally takes place within the Department of Polymer Chemistry and Technology, which stands out by the expertise in synthesis and characterization of polymers.

Examples of current cutting-edge interdisciplinary research extend to areas such as structure manipulation of highly porous templated materials for use as water purification materials, for carbon dioxide capture and as materials for use in tissue engineering. Research also includes the preparation of nanocomposites with improved properties and chemical recycling, aimed at the decomposition of polyamides and polyurethane foams to basic building blocks, as well as the use of new bio-based building blocks such as levulinic acid for polymer synthesis, development of special biodegradable polymer formulations for packaging processes for targeted biomass conversions etc. The research infrastructure of the institute with its NMR center and state-of-the-art electron microscopes provides great support to ongoing research.

For many years, the National Institute of Chemistry has been successfully combining excellence in research work with education, participation in key development initiatives such as SRIPs, and above all with cooperation with numerous partners from the economy.

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Materials science research is supported by state-of-the-art research equipment

Eden od pokazateljev odgovornega, trajnostnega ravnanja podjetij je spremljanje in zmanjševanje izpustov toplogrednih plinov. Učinkovita raba energentov in vhodnih materialov povečuje konkurenčnost podjetij, kar je dodaten motiv za prehod na nizkoogljičnost.

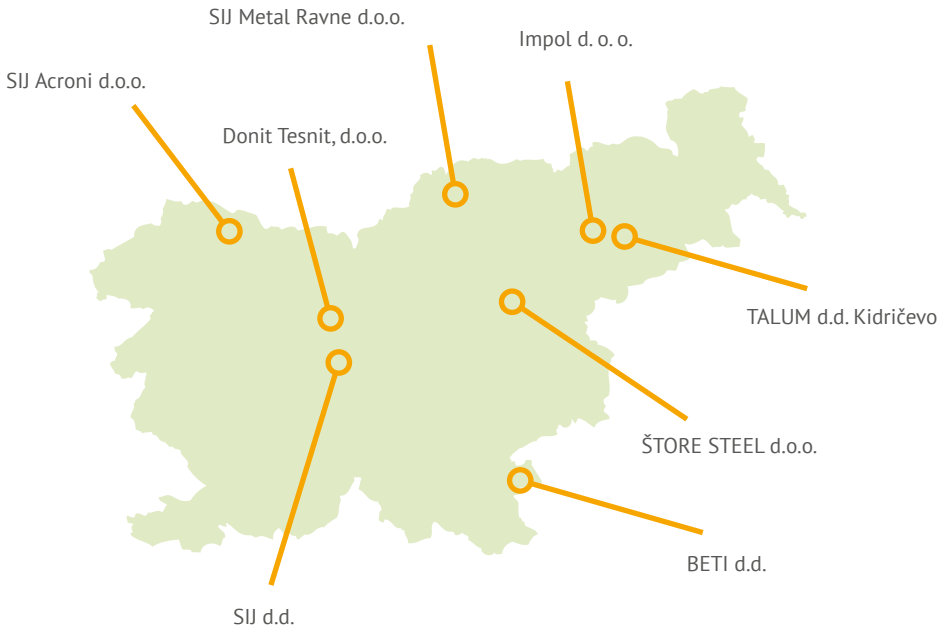
1. skupina: ETS podjetja

Nabor podjetij, ki so imela oziroma imajo zakonodajno regulirane izpuste toplogrednih plinov na ravni EU. O teh poročajo na letni ravni v okviru sistema trgovanja s pravicami do emisij toplogrednih plinov (EU ETS).

One of the indicators of responsible, sustainable management is monitoring and reducing greenhouse gas emissions. An efficient use of energy and raw materials increases competitiveness, which provides additional motivation to make a low carbon transition.

1st Group: ETS companies

This is a group of companies that must comply, or had to comply in the past with EU rules concerning GHG emissions. They monitor and report these emissions annually within the EU Emissions Trading System (EU ETS).



TALUM d.d. Kidričevo

Pot do podnebne nevtralnosti je v uporabi kovine prihodnosti – v aluminiju.
The path to climate neutrality is in the use of the metal of the future - aluminium.

Naslov Address	Tovarniška cesta 10, 2325 Kidričevo
Spletni naslov Web Address	www.talum.si
Glavna dejavnost Core business	C24.420 Proizvodnja aluminija // Aluminium production
Št. zaposlenih Nr. of employees	1462 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1947
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001, ISO 50001
Ogljični odtis Carbon footprint	1,226 t CO_2ek/t proizvodnje // 1.226 t CO_2-eq/t production

Preteklost Prvi aluminij je iz Talumovih elektroliznih peči pritekel leta 1954 in do leta 1983 je bilo v Kidričevem proizvedenih prvih milijon ton aluminija. Leta 1984 se je začela postopna tehnološka prenova z okoljsko prijaznejšo tehnologijo. Naslednji mejnik v preoblikovanju tovarne je bilo leto 2000, ko se je začela 2. faza projekta modernizacije v okviru katere je Talum dopolnil svojo rast tudi s predelavo odpadnega aluminija in izvedel investicije s področja okoljevarstva. Leto 2012 je zaznamovalo intenziviranje prestrukturiranja z inovativnostjo v smeri rasti dodane vrednosti in trajnostne preobrazbe. V letu 2019 smo prvič v zgodovini tovarne naredili več izdelkov iz recikliranega, pretaljenega aluminija kot iz elektroliznega aluminija, dodana vrednost na zaposlenega se je glede na leto 2012 podvojila.

Sedanjost Talum se v svetovnem merilu uvršča v ozek krog najučinkovitejših proizvajalcev elektroliznega aluminija in najbolj kakovostnih izdelkov iz aluminija. V zadnjem desetletju smo še intenzivirali prestrukturiranje svoje proizvodnje v smeri ogljično nevtralnih izdelkov in spremenili strukturo vhodnega materiala v smeri povečane reciklaže različnih vrst odpadnega aluminija. Aluminij je s svojimi lastnostmi, kot so majhna gostota, dobra električna in toplotna prevodnost, dobre mehanske lastnosti in odpornost na korozijo odlična kovina, s katero lahko znižujemo ogljični odtis v transportni, pakirni, gradbeni in elektro industriji.

Glavni proizvodi:

- Rondelice in rondele za pakirno industrijo
- Drogovi za ekstruzijo (za strojno, transportno in gradbeno industrijo)
- Aluminijasti ulitki (za transportno industrijo, E-mobilnost, elektro industrijo)
- Ploščati toplotni prenosniki (za uparjalnike, kondenzatorje, absorberje, E-mobilnost)

Ponosni smo ... na znanje in inovativnost naših sodelavcev, s katerim smo tovarno dvignili na visok tehnološki nivo. Z lastnimi razvojno-raziskovalnimi aktivnostmi smo razvili nove zlitine in izdelke z višjo dodano vrednostjo, ki izpolnjujejo najvišja pričakovanja kupcev..

Vizija Z lastno, energetsko učinkovito proizvodnjo in predelavo aluminija, ki ga bomo uporabljali za nadaljnjo proizvodnjo izdelkov z višjo dodano vrednostjo, se bomo uvrščali med največje izvoznike v Sloveniji. Našim kupcem bomo ponujali celovite rešitve v obliki vedno kompleksnejših storitev in izdelkov, s katerimi bomo reševali njihove izzive, sebi pa omogočali razvoj in rast dodane vrednosti. Temelj za doseganje višje dodane vrednosti bo znanje, ustvarjalnost in inovativnost naših zaposlenih ter razvojna partnerstva, s čimer bomo zaključili trajnostni prehod v ogljično nevtralnost in krožno gospodarjenje.

Past The first aluminium started to flow from Talum's electrolysis furnaces in 1954, and by 1983 the first million tons of aluminium had been produced in Kidričevo. In 1984, a gradual technology renovation with more environmentally friendly technologies began. The next milestone in the transformation of the factory was the year 2000, when the 2nd phase of the modernisation project began, in which Talum supplemented its growth also by processing aluminium scrap and carried out investments in the field of environmental protection. The year 2012 was marked by the intensification of restructuring with innovation in the direction of added value growth and sustainable transformation. In 2019, for the first time in the history of the factory, we made more products from recycled, molten aluminium than from electrolytic aluminium, and the value added per employee doubled compared to 2012.

Present Globally, Talum ranks among the top efficient producers of electrolytic aluminium and highest quality aluminium products. In the last decade, we have intensified the restructuring of our production in the direction of carbon-neutral products and changed the structure of the input material in the direction of increased recycling of various types of scrap aluminium. Aluminium, with its properties such as low density, good electrical and thermal conductivity, good mechanical properties and corrosion resistance, is an excellent metal with which we can reduce the carbon footprint in the transport, packaging, construction and electrical industries.

Primary products:

- Slugs and discs
- Aluminium billets
- Aluminium castings
- Aluminium flat heat exchangers

We are most proud of... the knowledge and innovation of our employees, with whom we have raised the factory to a high technology level. Through our own R&R activities, we have developed new alloys and products with higher added value that meet the highest customer expectations.

Vision With our own, energy-efficient production and recycling of aluminium, which we will use for further production of products with higher added value, we will rank among the largest exporters in Slovenia. We will offer our customers comprehensive solutions in the form of increasingly complex services and products, with which we will solve their challenges and enable ourselves the development and growth of added value. The basis for the achievement of higher added value will be the knowledge, creativity and innovation of our employees and development partnerships, thus completing the sustainable transition to carbon neutrality and circular management.

Impol d. o. o.

V Impolu prevzemamo odgovornost za prihodnost našega planeta.
At Impol, we take responsibility for the future of our planet.

Naslov Address	Partizanska ulica 38, 2310 Slovenska Bistrica
Spletni naslov Web Address	www.impol.si
Glavna dejavnost Core business	C24.420 Proizvodnja aluminijastih izdelkov in polizdelkov // Production of aluminium products ald semiproducts
Št. zaposlenih Nr. of employees	1356 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1974
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001, EN 9100, EN 15088, ASI Performance Standard
Ogljični odtis Carbon footprint	0,982 t CO_2ek/t proizvodnje // 0.982 t CO_2-eq/t production

Preteklost Zgodovina Impola sega v leto 1825, ko se je na obronkih Pohorja v Slovenski Bistrici pričela proizvodnja bakrenih izdelkov. V štiridesetih letih 20. stoletja se je začel preusmerjati v proizvodnjo aluminijevih izdelkov. Danes je Impol mednarodno podjetje, ki zaposluje več kot 2.400 ljudi (v Sloveniji 1.400) in se usmerja v proizvodnjo aluminijastih izdelkov višje dodane vrednosti, osvaja postopke dodatnih obdelav in finalizacije izdelkov, vstopa na najzahtevnejše trge.

Sedanjost V zadnjih tridesetih letih smo s pomočjo tehnoloških izboljšav uspešno izpeljali številne projekte in bistveno zmanjšali vplive na okolje. Delujemo z naravo in ne proti njej, izbiramo okolju prijazne tehnološke rešitve in enako pričakujemo od svojih dobaviteljev, zunanjih sodelavcev in poslovnih partnerjev. Redno sprejemamo okoljske cilje in zagotavljamo vire za njihovo uresničitev. Iz leta v leto izboljšujemo svoje okoljsko ravnanje in postajamo prijaznejši do okolja.

Glavni proizvodi:
- Aluminijaste palice
- Aluminijasti profili
- Pločevine iz aluminija
- Aluminijasta folija

Ponosni smo ... Pri vseh novih naložbah sledimo zahtevam za večanje energetske učinkovitosti in zmanjševanje izpustov toplogrednih plinov. V zadnjih letih smo porabo nekaterih energentov precej zmanjšali.

Vizija Naše temeljne usmeritve v prihodnosti so: intenzivno povečujemo delež porabe sekundarnega aluminija, zmanjšujemo neugodne vplive na okolje, vse nove tehnologije morajo biti skladne s tehnikami BAT (BREF), sistematično zmanjšujemo porabo energentov, del električne energije proizvedemo iz obnovljivih virov, varujemo okoliške vode in ohranjamo življenje v njih, minimiziramo porabo nevarnih snovi in posledično nastanek nevarnih odpadkov, zmanjšujemo hrup in emisije.

Past The history of Impol dates back to 1825 when the manufacture of copper products began in Slovenska Bistrica. In the 1940s, Impol started redirecting its activities to the manufacture of aluminium products. Today, Impol is an international company employing over 2,400 people (1,400 of which in Slovenia). It is focused on manufacturing high value-added aluminium products, mastering additional treatment and finishing, and entering the most demanding markets.

Present In the last thirty years, we successfully completed several projects reducing our environmental impact through technological improvements. We work with nature and not against it; we opt for environmentally sound technological solutions and expect the same from our suppliers, external collaborators and business partners. We regularly adopt environmental objectives and provide resources to achieve them. Year after year, we improve our environmental awareness and become more eco-conscious.

Primary products:

- Aluminium rods
- Aluminium profiles
- Aluminium rolled products
- Aluminium foils

We are most proud of... In our new investments, we respect demands for increasing energy efficiency and reducing greenhouse emissions. In recent years, our use of energy sources has decreased significantly.

Vision Our fundamental guidelines are: Intensively increasing the share of secondary aluminium used, reduce negative environmental impact, have all new technologies comply with BAT (BREF) techniques, systematically reduce the use of energy sources., generate a portion of our electricity from renewable sources, protect surrounding waters and preserve the organisms living in them, minimise the use of hazardous materials and the generation of hazardous waste, reduce noise and emissions.

BETI d.d.

ZELENO. VITKO. INOVATIVNO.
GREEN. LEAN. INNOVATIVE.

Naslov Address	Tovarniška cesta 2, 8330 Metlika
Spletni naslov Web Address	www.beti.si/
Glavna dejavnost Core business	C13.100 Priprava in predenje tekstilnih vlaken // Preparation and spinning of textile fibres
Št. zaposlenih Nr. of employees	124 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1956
Certifikati Certificates	ISO 9001, OEKO-TEX® certifikat STANDARD 100, GRS certifikat // ISO 9001, STANDARD 100 by OEKO-TEX®, GRS Certificate
Ogljični odtis Carbon footprint	5,598 t CO_2ek/t proizvodnje // 5.598 t CO_2-eq/t production
Referenčna vrednost Reference value	5,64 t CO_2ek/t proizvodnje // 5.64 t CO_2-eq/t production
Opombe Remarks	Primerjalno na preteklo leto // Referring to previous year

Preteklost Beti je bila ustanovljena leta 1956. V Sloveniji in Jugoslaviji je bila Beti dobro uveljavljena blagovna znamka spodnjega perila in kopalk. Do danes se je ohranila le proizvodnja preje, ki je z zgodnjo internacionalizacijo vstopila na trge od ZDA, Evrope, Rusije, Belorusije do Izraela in Indije. Beti se je uveljavila kot vodilni evropski proizvajalec in razvojni dobavitelj specialne barvane preje za svetovno priznane znamke na področju športa, prostega časa, medicine in na tehničnem področju.

Sedanjost Znani smo po naši kvaliteti, partnerstvu in prilagodljivosti. Z individualnim in celovitim pristopom našim kupcem zagotavljamo visoko kakovostne barvane PA in PES preje. Z našimi partnerji razvijamo nove izdelke z zahtevnimi funkcionalnostmi, hkrati pa se ambiciozno lotevamo projektov izboljšav na področju industrije 4.0, zmanjševanja vplivov na okolje ter ustvarjanja boljših pogojev dela.

Glavni proizvodi:

- Barvana, visoko elastična poliamidna (PA) preja
- Barvana, visoko elastična poliesterna (PES) peja
- DyeCare 1.0. – 100-odstotno reciklirana barvana preja
- Barvana reciklirana preja

Ponosni smo ... Ponosni smo na naše sodelavce, ki zagotavljajo nemoten servis našim kupcem, razvijajo nove izdelke ter izboljšujejo procese skladno z našo Trajnostno strategijo.

Vizija Leta 2020 smo sredi pandemije oblikovali novo Trajnostno poslovno strategijo 2020 – 2025 in začeli s transformacijo v najsodobnejšega dobavitelja specialnih barvanih in tehničnih prej, trajnostno naravnani v vseh naših aktivnostih. Postavili smo nov poslovni model, temelječ na inovativnosti ter sodelovanju s kupci, dobavitelji, strokovnjaki, institucijami znanja in to tako, da se medsebojno spodbujamo in podpiramo na vzajemno koristen način. Beti leta 2025 bo še bolj zelena, vitka in inovativna.

Past Beti was founded in 1956. In Slovenia and Yugoslavia it was a well established brand for underwear and swimwear. Today the dyed yarn production is the only remaining unit. Through early internationalization Beti's yarn is sold from USA, Europe, Russia, Belarus, to Israel and even India. Beti became a leading European producer and R&D supplier of special dyed yarns for many reputable world brands in sports, leisure, medical and technical field.

Present Beti is known for its quality, partnership and flexibility. Through an individual and comprehensive approach we provide high quality dyed PA and PES yarns for our customers all over the world. Together with our partners we are developing new products with special functionalities. At the same time, we are ambitiously implementing improvements in the field of industry 4.0., reducing our environmental impact and creating better working conditions.

Primary products:

- High elastic dyed polyamide (PA) yarn
- High elastic dyed polyester (PES) yarn
- DyeCare 1.0 – 100 % recycled dyed PES yarn
- Dyed recycled yarn

We are most proud of... We are proud of our team that provides perfect service to our customers, developing new products and improving our process in line with our Sustainability business strategy.

Vision During the pandemic 2020, we designed our new Sustainable business strategy 2020 – 2025 and started to transform Beti to become an expert supplier of special dyed and technical yarns with sustainability in the centre of all our activities. A new business model was formed based on innovation and cooperation with customers, suppliers, experts, R&D institutions in the way that that all sides encourage and support each other in a mutually beneficial way. Beti 2025 will be even more green, lean and innovative.

Donit Tesnit, d.o.o.

Vsi bivamo pod isto streho.
Spoštujmo in skrbimo za Naravo!
We all live under the same roof.
Respect and Care for Nature!

DONIT®
A perfect fit

Naslov Address	Cesta komandanta Staneta 38, 1215 Medvode
Spletni naslov Web Address	www.donit.eu
Glavna dejavnost Core business	C20.590 Proizvodnja in ponudba tesnilnih rešitev za različne panoge // Manufacture & supply of sealing solutions for industry
Št. zaposlenih Nr. of employees	189 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1946
Certifikati Certificates	Integriran sistem upravljanja ISO 9001 & ISO 14001 // Integrated Management System ISO 9001 & ISO 14001
Ogljični odtis Carbon footprint	1,848 t CO_2ek/t proizvodnje // 1.848 t CO_2-eq/t production

Preteklost

- 1946 TESNILKA MEDVODE-Slovenija, ki jo je ustanovil inž. E. Bregar-Don za oskrbovanje Tovarne Avtomobilov Maribor.
- 1992 Restrukturiranje podjetja: »spin-off« različnih dejavnosti podjetja razen proizvodnje mehkih TESNILNIH MATERIALOV.
- 1997 Pridobljen status delniške družbe.
- 2001 DONIT prevzame TESNILA TIT d.o.o.-Slovenija, leta 2014 pa DISS-Europe BVBA-Belgija.
- 2008 skupina MSIN-Slovenija prevzame DONIT.
- 2012-2022 DONIT ustanovi hčerinske družbe na Kitajskem, v Indiji, ZDA in Nemčiji.

Sedanjost Naša politika: ponudba profesionalnih (certificiranih) izdelkov in rešitev za tesnjenje, izdelanih v EU, in spoštovanje ljudi in okolja nas pozicionira kot zanesljivega poslovnega partnerja z dolgoročnim sodelovanjem v številnih industrijskih sektorjih v >65 državah. Prizadevamo si za ODLIČNOST v:

- RR; ustvarjamo inovativne izdelke in vlagamo v ljudi in visoke tehnologije,
- proizvodnji; vlaganje v ljudi, stroje in okolju prijazne tehnologije,
- storitvah za stranke.

Glavni proizvodi:

- Družina materialov TESNIT, npr. BA--SOFT
- Družina materialov DONIFLEX, npr. G-U
- Družina materialov GRAFILIT, npr. IQ

Ponosni smo ...

- Servisiramo 100+ kupcev v različnih panogah.
- Smo največji proizvajalec mehkih tesnilnih materialov v EU.
- Močen RR za uvajanje novih tesnilnih izdelkov & rešitev.

Vizija

- Naša vizija »BOLJŠI JUTRI Z DONITOVIMI IZDELKI« je dosegljiva s širjenjem NAPREDNIH PROIZVODOV. To zahteva multidisciplinarno sodelovanje na področju RR, proizvodnje in doseganja novih trgov preko naših prodajnih kapacitet. Naši izdelki so nadgradljivi s prihodnjimi tehnologijami in zagotavljajo zmanjšanje ubežnih emisij.
- TEHNIČNI NAPREDEK IN VARNOST: izdelki, ki bodo izhajali iz novega znanja in postopkov.
- Ohranjanje ZDRAVJA IN OKOLJA ter učinkovita raba virov.

Past

- 1946 TESNILKA MEDVODE-Slovenia, founded by Engr. E. Bregar-Don, to supply "Tovarna Avtobilov Maribor" plant with gaskets.
- 1992 The company was restructured: spinning-off core activities and maintaining the GASKET specialty.
- 1997 Joint-stock Co. status was acquired.
- 2001 DONIT acquired TESNILA TIT. ltd.-Slovenia, and in 2014 DISS-Europe BVBA-Belgium
- 2008 DONIT was acquired by MSIN Group-Slovenia.
- 2012-2022 DONIT established subsidiaries in China, India, USA, and Germany.

Present Our policy of: Offering Professional (certified) Products & Sealing Solutions in Application Engineering made in the EU and Respecting People & the Environment has positioned us as a reliable business partner with long-term collaborations across a multitude of industrial sectors in >65 countries. We pursue EXCELLENCE in:

- R&D; creation of innovative products and investing in people & high-tec;
- Production; investing in people, machinery, and eco-friendly technologies;
- Customer service.

Primary products:

- TESNIT gasket materials, e.g. BA-SOFT
- DONIFLEX gasket materials, e.g. G-U
- GRAFILIT gasket materials, e.g. IQ

We are most proud of...

- A one-stop shop servicing 100+ customers in various industries.
- The largest producer of soft gasket materials in EU.
- Strong R&D introducing new sealing products & solutions.

Vision

- Our vision of A BETTER WORLD WITH DONIT PRODUCTS is achievable by dissemination and adoption of ADVANCED PRODUCTS. This implies multidisciplinary efforts in R&D, production, and reaching further markets via our sales. Our products are upgradable with future technologies and guarantee reduction of fugitive emissions.
- TECHNICAL ADVANCES AND SAFETY: products resulting from new knowledge and processes.
- Preserving HEALTH and ENVIRONMENT and efficient use of resources.

ŠTORE STEEL d.o.o.

Trajnostno izboljšujemo reciklirano jeklo.
We improve recycled steel sustainably.

Naslov Address	Železarska cesta 3, 3220 Štore
Spletni naslov Web Address	www.store-steel.si
Glavna dejavnost Core business	C24.100 Proizvodnja toplo valjanih in obdelanih jeklenih palic // Productin of hot rolled and cold processed steel bars
Št. zaposlenih Nr. of employees	487 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1997
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001
Ogljični odtis Carbon footprint	0,207 t CO_2ek/t proizvodnje // 0.207 t CO_2-eq/t production

Preteklost Od treh oralov do treh hektarov najboljših razpoložljivih tehnologij. Podjetje temelji na tradiciji proizvodnje jekla, ki sega že v leto 1851. Po pričevanju spisa sodne poravnave je tedanji lastnik v letu 1851 posedoval »zemljišče v Štorah, ki obsega 3 orale, na katerem sta zgrajeni pudlarna in valjarna«. Nasledniki Železarne Štore (Jeklo Štore, Inexa Štore, Štore Steel) so sooblikovali današnjo sliko visoko tehnološkega podjetja z uporabo najboljših razpoložljivih tehnologij.

Sedanjost RR projekti in reciklaža kot model zelenega prehoda. Podjetje je vpeto v dobaviteljsko verigo avtomobilske industrije, ki se sooča z globalnim izzivom za zmanjševanje ogljičnega odtisa v celotnem življenjskem ciklu proizvodov. Bistven prispevek podjetja je razvoj novih jekel z izboljšanimi lastnostmi (AHSS) in nižjo težo, ki prispevajo k znižanju porab in izpustov v celotnem času uporabe vozil (- 5,7 %). Zelenemu prehodu sledi tudi tehnologija reciklaže jeklenega odpadka kot vhodne surovine.

Glavni proizvodi:
- Vzmetna jekla
- Inženirska jekla
- Jekla s povečano obdelovalnostjo

Ponosni smo ... Smo vodilni proizvajalec specialnih jekel v posameznih tržnih nišah, prepoznani po blagovnih znamkah Štore Steel, Exem Steel in Recycled Steel.

Vizija Za doseganje klimatskih ciljev bo potreben 'okoljski kvantni skok', ki ga bodo krojile nove prebojne tehnologije. Z učinkom ETS postajajo investicije v zmanjševanje emisij TGP ekonomsko opravičene. Nadaljnje optimizacije bodo možne z aplikacijo novih prebojnih tehnologij (OVE, zeleni H2, zajem in predelava CO2). Ključna naloga je tako identifikacija perspektivnih postopkov in tehnologij, ki omogočajo pretvorbo ogljikovega dioksida za nadaljnjo uporabo v industriji (FreSMe).

Past From three furlongs to three hectares of the best available technology. The company's tradition of producing steel dates back to 1851. According to court records, in 1851 the then owner owned »land in Štore, covering three furlongs, on which a puddling plant and rolling mill was built«. The successors of Železarna Štore (Jeklo Štore, Inexa Štore, Štore Steel) co-created today's high-tech company using the best available technologies.

Present R&D projects and recycling as a model of the green transition. The company is embedded in the automotive supply chain, which faces the global challenge of reducing its carbon footprint throughout the product life cycle. The company's significant contribution is the development of AHSSteel and lower weight, which contribute to the reduction of consumption and emissions during the entire period of vehicle use (by 5.7 %). The green transition is followed by the technology of recycling steel scrap.

Primary products:

- Spring steel
- Engineering steel
- Extra machinability steel

We are most proud of... We are a leading manufacturer of specialized steels for individual market niches, and we are recognized under the Štore Steel, Exem Steel and Recycled Steel brands.

Vision Achieving climate goals will require an 'environmental quantum leap' made possible by new breakthrough technologies. With the ETS, investments in reducing GHG emissions are becoming economically viable. Further optimizations will be possible with the application of new breakthrough technologies (RES, green H2, CO2 capturing and processing). The key task, thus, is to identify promising processes and technologies that enable the conversion of carbon dioxide for further use in industry (FreSMe).

SIJ d.d.

Jeklarstvo – motor krožnega gospodarstva.
Steelmaking – the engine of the circular economy.

Naslov Address	Gerbičeva ulica 98, 1000 Ljubljana
Spletni naslov Web Address	www.sij.si
Glavna dejavnost Core business	M70.100 Dejavnost uprav podjetij // Activities of head offices
Št. zaposlenih Nr. of employees	117 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1969
Certifikati Certificates	EN 9100, ISO 14001
Ogljični odtis Carbon footprint	481 t CO_2ek/t proizvodnje // 481 t CO_2-eq/t production

Preteklost Skupina SIJ ima svoje korenine že v fužinarstvu v 14. stoletju. Leta 1969 se je slovenska železarska industrija združila v Slovenske železarne. Leta 1986 so bili ukinjeni še zadnji plavži. S prestrukturiranjem sta bili ustanovljeni družbi Acroni in Metal Ravne, danes SIJ Acroni in SIJ Metal Ravne. Leta 2007 postane novi večinski lastnik Skupine SIJ ruska skupina Koks, ki začne z intenzivnimi naložbami v posodobitev proizvodnje.

Sedanjost Skupina SIJ je med tremi največjimi proizvajalci debele nerjavne pločevine v EU, tretji največji proizvajalec orodnih jekel v EU in med desetimi največjimi proizvajalci industrijskih nožev na svetu. Delujemo po načelih krožnega gospodarstva in izkoriščamo lastno surovinsko bazo za dostop do jeklenega odpadka v skladu s strategijo vertikalne integracije. Ta nam omogoča izrabo celotne verige vrednosti od surovin do končnih proizvodov.

Glavni proizvodi:

- Nerjavna jekla – SINOXX
- Orodna jekla - SIHARD, SITHERM, SIMOLD
- Industrijski noži in valji
- Varilni materiali

Ponosni smo ... Ponosni smo na 400 let tradicije, na naše zaposlene, ki s svojo jekleno voljo Skupini SIJ omogočajo nadaljevanje bogate zgodovine z nenehnimi inovacijami in novimi rešitvami.

Vizija Trajnostno rast in učinkovitost bomo dosegali z usmerjenostjo h kupcem, z izdelki z višjo dodano vrednostjo in zavzetimi zaposlenimi. Delovali bomo po načelih trajnostnega razvoja in krožnega gospodarstva, ter še naprej zniževali naš ogljični odtis. Priložnosti vidimo v nadaljnjem razvoju jekel za najzahtevnejše aplikacije, ki so plod našega lastnega razvoja, ter elektro jekel za uporabo v pogonskih motorjih električnih vozil.

Past The SIJ Group has its roots in ironworks as early as the 14th century. In 1969, the Slovenian iron industry merged into Slovenske železarne. In 1986, the last blast furnaces were abolished. With the restructuring, the companies Acroni and Metal Ravne were established, today SIJ Acroni and SIJ Metal Ravne. In 2007, the new majority owner of the SIJ Group became the Russian group Koks, which began intensive investments in the modernization of production.

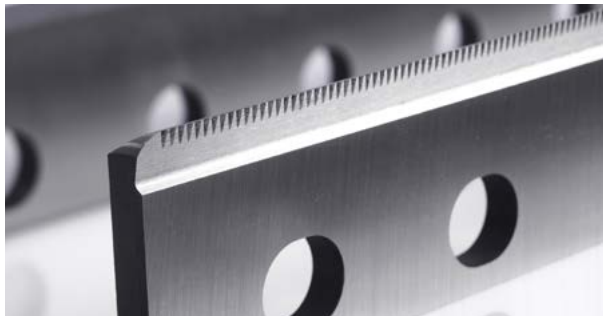
Present SIJ Group is among the three largest manufacturers of stainless quarto plates in the EU, the third largest manufacturer of tool steel in the EU, and among the 10 largest manufacturers of industrial knives in the world. We operate in line with the principles of circular economy and utilize our vertical integration strategy for access to steel scrap through our own raw material base which allows us to cover the entire value chain from raw materials to end products.

Primary products:

- Stainless Steel - SINOXX
- Tool Steel – SINOXX, SITHERM, SIMOLD, SI
- Industrial knives and rolls
- Welding consumables

We are most proud of... We are proud of 400 years of tradition, our employees, who with their mind of steel enable SIJ Group to continue its rich history with constant innovations and new solutions.

Vision We will achieve sustainable growth and efficiency by continuing our strong customer focus, with products with added value and engaged employees. We will operate on the principles of sustainable development and the circular economy, and continue to reduce our carbon footprint. We see opportunities in the further development of steels for the most demanding applications, which are the result of our own research and development, and electric steels for use in electric motor propulsion engines.



SIJ Acroni d.o.o.

Jeklarstvo – motor krožnega gospodarstva.
Steelmaking – the engine of the circular economy.

Naslov Address	Cesta Borisa Kidriča 44, 4270 Jesenice
Spletni naslov Web Address	www.sij.acroni.si
Glavna dejavnost Core business	C24.100 Proizvodnja surovega železa, jekla, ferozlitin // Manufacture of basic iron and steel and of ferro-alloys
Št. zaposlenih Nr. of employees	1335 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1992
Certifikati Certificates	ISO 9001, ISO 14001, ISO 45001, ISO 50001

Preteklost Fužinarski obrati so se v 19. stoletju združili v Kranjsko industrijsko družbo – KID. Leta 1969 je Železarna Jesenice postala del Slovenskih železarn, z njihovim prestrukturiranjem pa je bila leta 1992 ustanovljena družba Acroni, danes SIJ Acroni. Slovenske železarne se leta 2005 preimenujejo v SIJ – Slovensko industrijo jekla, katere novi večinski lastnik postane leta 2007 ruska skupina Koks. V SIJ Acroniju in celotni skupini se začne obdobje intenzivnih vlaganj v modernizacijo proizvodnje.

Sedanjost SIJ Acroni je trenutno najbolj prepoznan kot eden izmed treh vodilnih proizvajalcev debele nerjavne pločevine v EU. Že vrsto let smo prisotni na trgu elektropločevin, po investiciji v novo peč za toplotno obdelavo pa smo se začeli uveljavljati tudi na trgu specialne debele pločevine, s poudarkom na visokotrdnostnih in obraboodpornih jeklih.

Glavni proizvodi:
- Nerjavna debela pločevina – SINOXX
- Specialna jekla – SIDUR, SIMAXX
- Elektro pločevina - SIWATT
- Orodna jekla - SIMOLD

Ponosni smo ... Ponosni smo na 400-letno jeklarsko tradicijo in več kot 200 kvalitet jekel različnih dimenzijskih oblik, na skladnost proizvodov s svetovnimi standardi in na visoko kakovost jekla.

Vizija Na področju nerjavne debele pločevine utrjujemo položaj med tremi največjimi proizvajalci nerjavne debele pločevine v EU, pridobivamo tržni delež na področju specialnih jekel, hkrati pa s pomočjo novih investicij nadaljujemo razvoj elektro jekel, predvsem v smeri posebnih magnetnih kakovosti za uporabo v pogonskih motorjih električnih vozil.

Past Jesenice ironworks amalgamated to establish Kranjska industrijska družba – KID (the Carniolan Industrial Company). In 1969 Železarna Jesenice becomes a part of Slovenske železarne and with its restructuring in 1992 Acroni, now SIJ Acroni was established. In 2005 was renamed SIJ - Slovenska industrija jekla. In 2007, the Russian Koks Group became the new majority owner, and since then a period of intensive investments in modernization of the production.

Present SIJ Acroni is one of the three leading suppliers of stainless quarto plates in EU. We are present for many years on the electrical steel market. After the investment in new heat treatment line we are gaining importance on special steel market, mostly in the field of wear resistant and high strength steel plates.

Primary products:

- Stainless quarto plates – SINOXX
- Special steel quarto plates – SIDUR, SIMAXX
- Electrical steel - SIWATT
- Tool steel plates - SIMOLD

We are most proud of... We are proud of our 400-year steel tradition, more than 200 qualities of steels of various dimensions, the compliance of products with world standards and high quality of steel.

Vision We are strengthening our top three position on stainless quarto plates market in EU, we are gaining market share on special plates market. With new investments in electrical steel production we are continuing development of electrical steel, mostly in the direction of special grades, for usage in electric vehicle motors.

SIJ Metal Ravne d.o.o.

Jeklarstvo – motor krožnega gospodarstva.
Steelmaking – the engine of the circular economy.

Naslov Address	Koroška cesta 14, 2390 Ravne na Koroškem
Spletni naslov Web Address	sij.metalravne.com
Glavna dejavnost Core business	C24.100 Proizvodnja surovega železa, jekla, ferozlitin // Manufacture of basic iron and steel and of ferro-alloys
Št. zaposlenih Nr. of employees	1000 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1992
Certifikati Certificates	EN 9100, ISO 14001, ISO 45001, ISO/IEC 17025

Preteklost Proizvodnja jekla na Koroškem sega v stari vek. Grofje Thurn so v 19. stoletju združili manjše železarne v Železarno Ravne, ki leta 1969 postane del Slovenskih železarn, z njihovim prestrukturiranjem pa je bila leta 1992 ustanovljena družba Metal, danes SIJ Metal Ravne. Slovenske železarne se leta 2005 preimenujejo v SIJ – Slovensko industrijo jekla, katere novi večinski lastnik postane leta 2007 ruska skupina Koks. V SIJ Metalu Ravne in celotni skupini se začne obdobje intenzivnih vlaganj.

Sedanjost Lastne jeklarna, kovačnica, valjarna ter različne vrste toplotne in mehanske obdelave zagotavljajo več kot 200 kvalitet jekel različnih dimenzijskih oblik - od ogljičnih in legiranih konstrukcijskih do orodnih, kjer smo med prvimi tremi proizvajalci v EU, ter specialnih jekel v obliki valjanih in kovanih proizvodov. Proizvodi SIJ Metala Ravne so skladni s svetovnimi standardi in opremljeni z ustreznimi atesti. Priložnost smo poiskali v nišni proizvodnji.

Glavni proizvodi:

- Nerjavna in specialna jekla - SINOXX
- Orodna jekla za delo v hladnem – SIHARD
- Orodna jekla za delo v vročem – SITHERM
- Orodna jekla za plastiko – SIMOLD

Ponosni smo ... Ponosni smo, da gradimo na 400 letih tradicije, na naše zaposlene, ki s svojo jekleno voljo Skupini SIJ omogočajo nadaljevanje bogate zgodovine z nenehnimi inovacijami.

Vizija Vlaganja v novo kovačnico težkih odkovkov, novo valjarno težkih profilov in ulivališče, nov EPŽ (elektropretaljevanje pod žlindro) omogočajo SIJ Metalu Ravne širitev ponudbe, usmeritev v rastoče tržne segmente in izdelke z višjo dodano vrednostjo. Zadovoljstvo kupcev nadgrajujemo z novimi proizvodi in storitvami, vlagamo v zadovoljstvo zaposlenih in smo predani trajnostnemu razvoju.

Past Steel production in Carinthia dates back to ancient times. In the 19th century, the Counts of Thurn merged smaller ironworks into Jeklarna Ravne. In 1969, it merged with the Jesenice and Štore ironworks into the Slovenske železarne company which were in 2005 renamed into the SIJ - Slovenska industrija jekla. In 2007, the Russian KOKS Group starts the investments in the modernization of the production.

Present Our own Steel Plant, Forging Shop, Rolling Mill and a wide range of heat treatment and machining processes allow us to produce a rich pallet of more than 200 steel grades in different dimensional shapes, from carbon and alloyed structural steels to tool, we are among leading three producers in EU, and special steels in the form of rolled and forged products. SIJ Metal Ravne products are made in accordance with international standards and they are provided with corresponding certificates.

Primary products:

- Stainless and special steel - SINOXX
- Cold work tool steel – SIHARD
- Hot work tool steel – SITHERM
- Plastic mould steel – SIMOLD

We are most proud of... We are proud to build on 400 years of tradition, on our employees, who with their will of steel enable SIJ Group to continue its rich history with constant innovations.

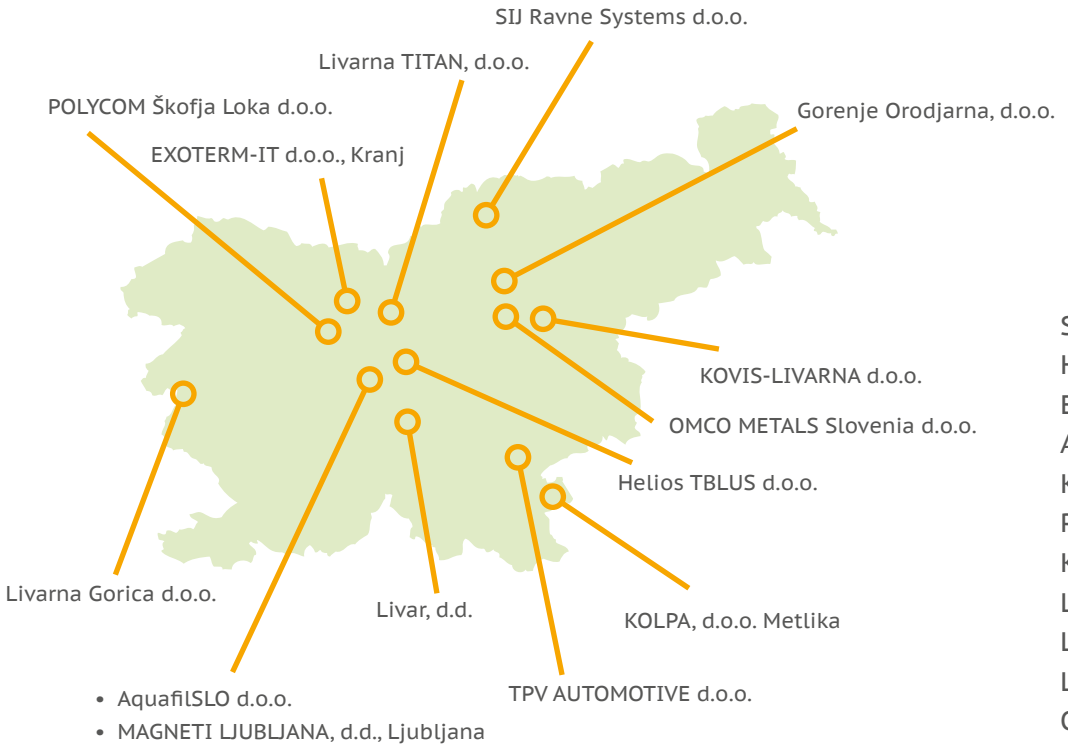
Vision Investments in a new forging shop for heavy forgings, the new rolling mill for heavy sections, and a modern teeming pit in SIJ Metal Ravne indicate our extended offer. We are a customer-oriented company constantly upgrading our products and services, investing in employee engagement and sustainable development.

2. skupina: neETS podjetja

Nabor podjetij, katerih motiviranost za učinkovito rabo energije in vhodnih materialov ter prehod na rabo obnovljivih virov energije v luči nizkoogljičnosti je poleg odgovornega, trajnostnega ravnanja zmanjševanje stroškov poslovanja in konkurenčna prednost na globalnem trgu.

2nd Group: non ETS companies

This is a group of companies that are motivated to manage energy and raw materials efficiently in light with the low carbon transition. This gives them a competitive advantage on the global markets together with reduced costs induced by responsible and sustainable management.



SIJ Ravne Systems d.o.o.

Jeklarstvo – motor krožnega gospodarstva.
Steelmaking – the engine of the circular economy.

Naslov Address	Koroška cesta 14, 2390 Ravne na Koroškem
Spletni naslov Web Address	sij.ravnesystems.com
Glavna dejavnost Core business	C28.910 Proizvodnja metalurških strojev // Manufacture of machinery for metallurgy
Št. zaposlenih Nr. of employees	504 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	2016
Certifikati Certificates	ISO 9001, ISO 3834, ISO/IEC 17025

Preteklost Začetki segajo v stari vek. Grofje Thurn so v 19. stoletju združili manjše železarne v Železarno Ravne. Leta 1969 se je ta združila z ostalimi železarnami v Slovenske železarne. Leta 1991 so se Slovenske železarne reorganizirale v holding s samostojnimi podjetji. Slovenske železarne se leta 2005 preimenujejo v SIJ – Slovensko industrijo jekla, katere novi večinski lastnik postane leta 2007 ruska skupina Koks. V letu 2016 je s poslovanjem pričelo novo podjetje SIJ Ravne Systems d.o.o.

Sedanjost SIJ Ravne Systems spada med deset največjih proizvajalcev industrijskih nožev na svetu ter je eden vodilnih proizvajalcev industrijskih nožev in kovanih valjev v EU. Z edinstveno kombinacijo metalurškega in inženirskega znanja ponujamo širok nabor proizvodov in storitev različnim industrijam ter razvijamo in testiramo nove kvalitete jekel.

Glavni proizvodi:

- Industrijski noži za recikliranje, kovine, les, papir
- Kovani valji za valjanje pločevine
- Kovani valji za aluminijevo industrijo
- Sistemska oprema, deli, ohišja in komponente strojev

Ponosni smo ... Ponosni smo, da gradimo na 400 letih tradicije, na naše zaposlene, ki s svojo jekleno voljo Skupini SIJ omogočajo nadaljevanje bogate zgodovine z nenehnimi inovacijami.

Vizija Dolgoročni cilj SIJ Ravne Systems je nadaljevanje tradicije predelave jekla na Ravnah, krepitev pozicije med desetimi največjimi proizvajalci industrijskih nožev na svetu in med največjimi proizvajalci valjev v EU, ustvarjanje dodane vrednosti in novih delovnih mest, hkrati ostajamo v podjetju pri svojem delu družbeno odgovorni in skrbimo za razvoj ter zavzetost zaposlenih.

Past The beginning in Carinthia dates back to ancient times. In the 19th century, the Counts of Thurn merged smaller ironworks into Jeklarna Ravne. In 1969, it merged with the Jesenice and Štore ironworks into the Slovenske železarne company which were in 2005 renamed into the SIJ - Slovenska industrija jekla. In 2007, the Russian KOKS Group with its subsidiary Dilon became the new majority owner. In 2016, a new company, SIJ Ravne Systems ltd., started operating.

Present SIJ Ravne Systems is one of the ten largest manufacturers of industrial knives in the world and is one of the leading manufacturers of industrial knives and forged cylinders in the EU. With a unique combination of metallurgical and engineering knowledge, we offer a wide range of products and services to various types of industries and develop and test new steel qualities.

Primary products:

- Industrial knives-recycling, knives for metal, wood, paper
- Forged rolls for cold rolling mills
- Forged products for aluminium industry
- Assembled equipment, machine parts, housing and components

We are most proud of... We are proud to build on 400 years of tradition, on our employees, who with their will of steel enables SIJ Group to continue its rich history with constant innovations.

Vision The long-term goal of SIJ Ravne Systems is to continue the tradition of steel processing in Ravne, strengthen the position among the ten largest manufacturers of industrial knives in the world and among the largest manufacturers of forged cylinders in the EU, create added value and jobs, while remaining socially responsible and caring for employee development and engagement.

Helios TBLUS d.o.o.

V skupini HELIOS prisegamo na zeleno.
At HELIOS we turn it green.

Naslov Address	Količevo 65, 1230 Domžale
Spletni naslov Web Address	www.helios-group.eu/sl/
Glavna dejavnost Core business	C20.300 Proizvodnja barv, lakov in podobnih premazov, tiskarskih barv in kitov // Manufacture of paints, varnishes and similar coatings, printing ink and mastics
Št. zaposlenih Nr. of employees	866 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1924
Certifikati Certificates	ISO 9001, ISO 14001, Program odgovornega ravnanja® // ISO 9001, ISO 14001, Responsible Care®
Ogljični odtis Carbon footprint	0,168 t CO_2ek/t proizvodnje // 0.168 t CO_2-eq/t production

Preteklost Zgodovina podjetja Helios se je pričela pred več kot 110-imi leti na lokaciji tovarne Color v Medvodah, kjer so izvajali postopek, ki velja za predhodnika današnje proizvodnje alkidnih smol. Z ustanovitvijo podjetja Ljudevit Marx leta 1924 se je pričela proizvodnja lakov in barv na Količevem v Domžalah.

Od leta 2017 je skupina HELIOS del skupine KANSAI PAINT, enega vodilnih svetovnih proizvajalcev barv in premazov, in predstavlja njihov evropski center odličnosti.

Sedanjost Helios TBLUS d.o.o. ima v svojem asortimaju tako izdelke za široko potrošnjo kot tudi izdelke za

različne industrije in profesionalne uporabnike. Je največje proizvodno podjetje v skupini HELIOS in se uvršča med vodilne proizvajalce barv v Evropi. Več kot 100 razvojnikov deluje v oddelku za raziskave in razvoj, ki ima tudi vrhunsko opremljene laboratorije. Razvoj in proizvodnja sledita trendom in povpraševanju na trgu ter zasledujeta cilj zmanjšanja porabe virov in energije.

Glavni proizvodi:

- Arhitekturni in praškasti premazi
- Avtoreparaturni in cestni premazi
- Premazi za kovinsko in lesno industrijo
- Umetne smole

Ponosni smo ... Uspeh podjetja Helios TBLUS d.o.o. je rezultat dolgoletnega strokovnega znanja in naše zavezanosti k oblikovanju odličnih rešitev na najnovejši svetovni razvojni ravni ter upoštevanju sedanjih in prihodnjih trendov.

Vizija Stremimo k temu, da bi nas kupci prepoznali kot družbo, ki zagotavlja odličnost celotnega spleta: know-how-a, tehnologije, značilnosti in koloristike ter storitev za kupce. Prizadevamo si ravnati odgovorno do narave in podnebja skozi našo celotno vrednostno verigo. Podnebne spremembe naslavljamo s poslovnim modelom, ki bo zmanjšal naš vpliv na okolje. Od leta 2020 dalje se v sklopu iniciative »We turn it green« (Prisegamo na zeleno) osredotočamo na oprijemljive zelene ukrepe na štirih prednostnih področjih: ljudje, izdelki, nabava in proizvodnja.

Past The history of HELIOS began more than 110 years ago at the location of Color factory in Medvode, where a procedure that was a precursor to today's production of alkyd resins was carried out. With the foundation of the Ljudevit Marx Company in 1924, the production of varnishes and paints started at Količevo in Domžale. Since 2017, HELIOS is a part of KANSAI PAINT, one of the world´s leaders in the paints and coatings industry, representing their European Center of Excellence.

Present Helios TBLUS d.o.o. offers a wide range of coatings and solutions for various industries, professional users, and end customers. It represents the largest production plant within HELIOS, one of the leading paint manufacturers in Europe. More than 100 developers work in the R&D department with excellent labs. Development and production follow trends and demand on the market and pursue the goal of resource reduction and energy consumption.

Primary products:

- Architectural and powder coatings
- Car refinishing coatings and road marking paints
- Coatings for metal and wood industry
- Resins

We are most proud of... The success of Helios TBLUS d.o.o. is the result of decades of expertise and our commitment to design excellent solutions at the latest global development level and considering current and future trends.

Vision We are striving to be recognized as the company providing all-round excellence: know-how, technology, product characteristics, colouristic and customer service. Our ambition is to act responsibly towards nature and to take climate actions throughout our entire value chain. We are addressing climate change with a business model reducing our impact on the environment. Under the initiative We turn it green, as of 2020, we are focusing on tangible green actions in four priority areas: people, products, purchase and production.

EXOTERM-IT d.o.o., Kranj

Imamo samo en planet.
We only have one planet.

Naslov Address	Struževo 66, 4000 Kranj
Spletni naslov Web Address	www.exoterm.si
Glavna dejavnost Core business	C20.590 Proizvodnja drugih kemičnih izdelkov // Manufacture of other chemical products
Št. zaposlenih Nr. of employees	35 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	2002
Certifikati Certificates	ISO 9001, ISO 45001
Ogljični odtis Carbon footprint	8,48 t CO_2ek/eur prometa // 8.48 t CO_2-eq/eur income

Preteklost Družba je bila ustanovljena leta 2002. Osnovno dejavnost, proizvodnjo pomožnih sredstev za metalurgijo in livarstvo, je družba prevzela od ustanovitelja družbe EXOTERM d.d.. Družba je v letu 2008 prejela bronasto gazelo kot eno najhitrejših rastočih podjetij v Sloveniji.

Sedanjost Družba že vsa leta posluje stabilno in se dobro prilagaja razmeram v poslovnem okolju.

Glavni proizvodi:
- Izolacijski materiali za jeklene ingote
- Premazi za livarne
- Eksotermne mešanice
- Naogljičevalci

Ponosni smo ... Smo kvaliteten in verodostojen poslovni partner, v katerega zaupajo tako naši kupci kot dobavitelji.

Vizija Vizija podjetja je postati vodilni proizvajalec in dobavitelj pomožnih materialov za metalurško industrijo v jugovzhodni Evropi.

Past The company was established in 2002. The main activity, which is the production of auxiliaries for metallurgy and foundry, was taken over by the company from the founder of the company, which is EXOTERM joint stock company. In 2008, the company received a bronze gazelle as one of the fastest growing companies in Slovenia.

Present The company has been operating stably through all years and adapts well to the conditions in the business environment.

Primary products:

- Thermal insulation for steel ingots
- Coatings for foundries
- Exothermic mixtures
- Recarburiser

We are most proud of... We are a credible business partner of quality, whom customers and suppliers trust.

Vision The company's vision is to become the leading manufacturer and supplier of auxiliary materials for the metallurgical industry in Southeast Europe.

AquafilSLO d.o.o.

SNUJEMO IZDELKE, ki odpadnim materialom omogočajo neskončni življenjski cikel.
RETHINKING PRODUCTS by giving new life to waste materials, in an infinite cycle.

Naslov Address	Letališka cesta 15, 1000 Ljubljana
Spletni naslov Web Address	www.aquafil.com/where-we-are/slovenia/
Glavna dejavnost Core business	C20.600 Proizvodnja poliamidnih granulatov in filamentnih vlaken // Production of polyamide granulates and filament yarns
Št. zaposlenih Nr. of employees	857 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1966
Certifikati Certificates	ISO 9001, ISO 14001, ISO 45001, ISO 50001, Program odgovornega ravnanja® // ISO 9001, ISO 14001, ISO 45001, ISO 50001, Responsible Care®
Ogljični odtis Carbon footprint	0,95 t CO_2ek/t PA6 ECONYL® polimera // 0.95 t CO_2-eq/t of ECONYL® PA6 polymer
Referenčna vrednost Reference value	7,334 t CO_2ek/t PA6 izvornega polimera // 7.334 t CO_2-eq/t of virgin PA6 polymer
Opombe Remarks	Viri/Sources: EPD Econyl Polymer reg. n. S-P-00500; GaBi SP 40, PA6 granulate EU mix

Preteklost 1966 Kemična tovarna Moste v Ljubljani odpre prvo tovarno za izdelavo sintetičnih vlaken v Jugoslaviji, ki dobi ime Julon. Prva skupina izdelkov so bila najlonska vlakna za tekstil, kasneje pa tudi za tekstilne talne obloge. 1995 njen večinski lastnik postane italijanska družba Aquafil. Novi lastnik je vložil sredstva v posodobitev in razširitev proizvodnje, tudi na nove lokacije: Celje - Teharje, Senožeče, Ajdovščina ter podjetje uveljavil na svetovnem trgu. Od leta 2016 se imenuje AquafilSLO.

Sedanjost AquafilSLO je največji izdelovalec tekstilnih vlaken v Sloveniji in edini, ki je specializiran za izdelavo najlona 6 za oblačilno industrijo in industrijo talnih oblog. Od leta 2011 izvaja edinstveni postopek recikliranja najlona 6 na svetu, v katerem iz odsluženih izdelkov, kot so ribiške mreže in tekstilne talne obloge, ter industrijskih ostankov, ki vsebujejo najlon, pridobivajo regenerirani najlon ECONYL®. Je del mednarodne skupine Aquafil, ki ima 18 tovarn v sedmih državah na treh celinah.

Glavni proizvodi:
- ECONYL® - regenerirana vlakna najlona 6
- Dryarn® - polipropilenska mikrovlakna
- Vlakna najlona 6 za oblačila
- Vlakna najlona 6 za talne obloge

Ponosni smo ... AquafilSLO je del mednarodne Skupine Aquafil, ki je eden izmed vodilnih svetovnih izdelovalcev poliamida 6 ter referenca za kakovost in inovacije izdelkov.

Vizija Aquafil bo tudi v prihodnosti vztrajal na poti, ki v središče svojih vrednot in strategije postavlja krožno gospodarstvo. Ohranjanje virov, omogočanje novega življenja materialom, povečevanje učinkovitosti delovanja za ustvarjanje vrednosti: to so ambiciozni cilji, s katerimi je Skupina Aquafil postopoma postala mednarodna referenca za trajnostni razvoj. AquafilSLO bo ostal središče inovativnih tehnologij za pridobivanje materialov iz odsluženih izdelkov in depolimerizacijo v Skupini.

Past In 1966, the Chemical company Moste in Ljubljana opened the first synthetic fibers production in former Yugoslavia, named Julon. Production began with nylon fibers for apparel and expanded to fibers for carpets. In 1995, Italian Aquafil became its majority shareholder. The new owner modernised and expanded the production facilities also by setting up new plants in Celje - Teharje, Senožeče and Ajdovščina, placing the company to compete in world markets. In 2016 it changed its name to AquafilSLO.

Present AquafilSLO is the most important fibre manufacturer in Slovenia and the only one specialized in the production of nylon 6 for both the textile and the carpet industry. Since 2011 AquafilSLO has operated a globally unique nylon 6 recycling process, in which regenerated nylon ECONYL® is obtained from end-of-life products, such as fishing nets, old carpets, and industrial waste.The Company is part of the Aquafil Group, which has 18 plants in 7 countries on three continents.

Primary products:

- ECONYL® - regenerated nylon 6 yarns
- Dryarn® - polypropylene microfibers
- Nylon 6 fibers for apparel
- Nylon 6 fibers for carpets

We are most proud of... AquafilSLO is part of the international Aquafil Group, one of the global leading players in the production of Polyamide 6: a landmark in terms of quality and product innovation.

Vision Aquafil will keep up the path that places circular economy at the heart of its values and business strategy. Saving resources, giving new life to materials, operating in the most efficient way to create value: these are the ambitious objectives that have led the Group to become a point of reference for sustainability at an international level. AquafilSLO will remain the centre of innovative technologies for material recovery from end-of-life products and depolymerisation in the Group.

KOLPA, d.o.o. Metlika

Zmanjšanje odpadkov oziroma negativnih vplivov na okolje za 20 % letno.
Reduction of waste / negative impacts on the environment by 20 % annually.

Naslov Address	Rosalnice 5, 8330 Metlika
Spletni naslov Web Address	www.kolpa.si
Glavna dejavnost Core business	C22.230 Proizvodnja in predelava plastičnih mas // Production and processing of plastics
Št. zaposlenih Nr. of employees	412 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1978

Preteklost Leta 1978 je obrat postal pravna oseba in takrat se je začela proizvodnja z dvema modeloma kopalnih kadi – blagovna znamka Kolpa san. Leta 1991 je sledila vzpostavitev blagovne znamke Kerrock. Med letom 1997 in 2003 je bilo obdobje izredno velike rasti, saj se je prodaja več kot podvojila, družba pa je ustanavljala podjetja. Leta 2008 je odprla svoj prvi razstavno-prodajni salon v Metliki. Sledile so nagrade, kot so SiBrand, Red Dot, Super Brand Slovenia ter druge nagrade za gospodarske dosežke.

Sedanjost Smo eden izmed vodilnih ponudnikov kopalniške opreme na področju jugovzhodne Evrope.

Glavni proizvodi:

- Kopalne kadi (liti sanitarni akril)

Ponosni smo ... Lastni maloprodajni saloni (Slovenija, Hrvaška, Rusija), lastna podjetja (Hrvaška, Srbija, Črna Gora, Nemčija, Rusija).

Vizija Postati vodilno podjetje na področju kopalniške opreme srednjega in višjega cenovnega razreda v srednji Evropi.

Past In September 1978 the production facility became a legal entity beginning production of two models of bathtubs – under the Kolpa san commercial brand. The establishment of the Kerrock brand followed in 1991. Between 1997 and 2003, there was a period of extremely high growth, with sales more than doubling. The company expanded and set up new companies opening its first showroom in Metlika in 2008. This was followed by awards such as SiBrand, RedDot, Super Brand Slovenia and other awards for economic achievements.

Present We are one of the leading manufacturing companies of bathroom equipment in South Eastern Europe.

Primary products:

• Bathtubs made from cast sanitary acrylic

We are most proud of... Ownership of our showrooms (Slovenia, Croatia, Russia), and companies (Croatia, Serbia, Montenegro, Germany, Russia).

Vision Our vision is to become a leading manufacturing company for medium and high-class bathroom equipment in Middle Europe.

POLYCOM Škofja Loka d.o.o.

Odgovorno ravnanje in inovativno delovanje.
Responsible behavior and innovative operations.

POLYCOM
Integrated Polymer and Mould Solutions

Naslov Address	Dobje 10, 4223 Poljane nad Škofjo Loko
Spletni naslov Web Address	www.polycom.si
Glavna dejavnost Core business	C22.290 Proizvodnja drugih izdelkov iz plastičnih mas // Manufacture of other plastic products
Št. zaposlenih Nr. of employees	287 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1985
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001
Ogljični odtis Carbon footprint	4,7 t CO_2ek/t proizvodnje // 4.7 t CO_2-eq/t production

Preteklost Naša zgodba se začne 1. junija 1985. Prvi korak v avtomobilsko industrijo smo naredili leta 1991. Med prvimi v Sloveniji smo pridobili certifikat ISO 9002. Leta 2000 smo uvedli standard odgovornega ravnanja z okoljem ISO 14001, kar je prineslo veliko sprememb v smeri odgovornega poslovanja podjetja. Pridobili smo certifikat ISO TS 16949, s katerim smo zadovoljili potrebe kupcev avtomobilske industrije.

Sedanjost Polycom je sinonim za visoko kakovost in zanesljivost na področju predelave termoplastov in orodjarstva. Z odgovornostjo pristopamo tako k potrebam in izzivom naših strank kot ohranitvi naravnega okolja, od načrtovanja izdelkov, prototipov in izdelave orodja do testiranj in tehnoloških izboljšav. Smo inovativen in kakovosten ponudnik celovitih razvojnih rešitev za avtomobilsko in druge industrije, zanesljiv partner naročnikom in poslovnim partnerjem ter stabilen zaposlovalec perspektivnih kadrov.

Glavni proizvodi:

- Hibridni izdelki za avtomobilsko industrijo
- Hibridni izdelki za IIOT
- Orodja za predelavo termoplastov

Ponosni smo ... na znanje in izkušnje, pridobljene skozi leta. Najboljše rešitve so plod partnerskega dela.

Vizija Zadovoljstvo je merilo za uspeh. Naša ključna vodila so inovativnost, razvoj in kakovost. Stremimo k zadovoljnim naročnikom, poslovnim partnerjem in zaposlenim. Vizijo uresničujemo skupaj s svojimi dolgoročnimi partnerji, pri tem pa upoštevamo najvišje kakovostne, kadrovske in okoljske standarde.

Past Our story starts on June, 1st 1985. Our first step in the automotive industry was taken in 1991. We were among the first companies in Slovenia to acquire an ISO 9002 certificate. In the year 2000 we introduced the ISO 14001 environmental management system standard, which brought about several changes in the company's responsible management. In the year 2021 we have acquired the ISO TS 16949 standard to meet the needs of automotive industry buyers.

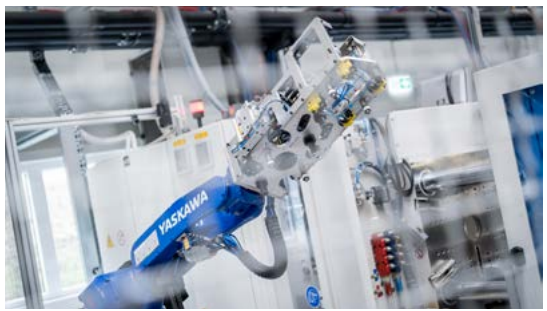
Present Polycom is a synonym for high quality and reliability in the field of thermoplastics and tool making. We address the needs and rise to the challenges from our customers responsibly, in order to keep the natural environment. This encompasses product planning, prototyping, and tool making, as well as testing and technological improvements. We are a reliable partner for our customers and business partners and a stable employer for prospective staff.

Primary products:

- Hybride products for automotive industry
- Hybride products for IIOT
- Tools for plastic processing

We are most proud of... our knowledge and experience that we gained through the years. The best solutions are a result of team work.

Vision Our key principles are innovation, development and quality. We strive to keep satisfied customers, business partners and employees. We carry out our vision with the help of our long-time partners, while taking into consideration the highest qualitative, human resources and environmental standards.



KOVIS-LIVARNA d.o.o.

To je ogljični odtis, ki si ga vsi želijo.
This is a carbon footprint, everyone wants.

Naslov Address	Železarska cesta 3, 3220 Štore
Spletni naslov Web Address	www.kovis-group.com/kl
Glavna dejavnost Core business	C24.510 Proizvodnja ulitkov iz sive in nodularne litine // Production of castings from grey and nodular cast iron
Št. zaposlenih Nr. of employees	255 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1999
Certifikati Certificates	ISO 9001, ISO 14001, ISO 45001, HPQ DB EBN 918 058, ŽSS Slovaške železnice, VUZ Češka // ISO 9001, ISO 14001, ISO 45001, HPQ DB EBN 918 058, ŽSS Slovak Railways, VUZ Czech Republic
Ogljični odtis Carbon footprint	0,00054 t CO_2ek/eur prometa // 0.00054 t CO_2-eq/eur income

Preteklost Podjetje Kovis Livarna je podjetje z dolgo tradicijo na področju livarstva. Skozi zgodovino razvoja se je srečevalo s številnimi izzivi, pred katere ga je postavljalo poslovno okolje. To so bile predvsem potrebe po dinamičnem razvoju in dosegu razvojnega koraka s konkurenco, potreba po aktivnem spremljanju in prožnem prilagajanju na spremembe v poslovnem okolju, kar je povzročilo tudi nenehno spreminjanje poslovnih procesov znotraj podjetja.

Sedanjost Smo podjetje, ki uspešno združuje tradicijo in nenehni razvoj s trajnostjo. Smo visoko razvojno inovativna livarna, ki je uspešno znala izkoristiti dane priložnosti in tako svojim ulitkom dajemo drugačno dimenzijo. Smo dobavitelj zahtevnih tehnoloških rešitev in kakovostnih ulitkov, ki se uporabljajo v različnih panogah po vsej Evropi. Predvsem smo dobavitelji ulitkov, ki se uporabljajo v proizvodnji železniških vozil, kmetijske mehanizacije, gradbene mehanizacije, strojegradnji, proizvodnji črpalk, armatur in ventilov ter ulitkov za gradbeništvo.

Glavni proizvodi:
- Zavorne plošče
- Ležajna ohišja

Ponosni smo ... Naše izjemno široko znanje livarstva, strokovnost, dolgoletne izkušnje, inovativen pristop, uporaba sodobnih tehnologij in opreme nam je v največji ponos, saj nam omogoča, da svojim naročnikom zagotovimo visoko zahtevne tehnološke rešitve in kratke dobavne roke. Z zadnjimi investicijami smo povečali konkurenčno prednost, dodano vrednost na zaposlenega in uresničili družbeno odgovornost na področju okolja. Postali smo najsodobnejša livarna v Evropi, nova tehnologija pa je skladna s trenutno najboljšimi razpoložljivimi tehnikami na evropskem trgu.

Vizija Izzive delovanja preteklega in sedanjega časa ter prihodnosti smo združili v viziji strateškega načrta. Postati želimo poslovno prožno, zeleno, obvladljivo in učinkovito podjetje na vseh področjih svojega delovanja. Z integracijo novih postrojenj v proizvodni proces livarne bomo vpeljali tudi industrijo 4.0, ki nam bo omogočila celotno sledljivost in optimiziran nadzor nad proizvodnim procesom, tehnologijo, vzdrževanjem in energenti.

Past The company Kovis Livarna has a long tradition in the field of foundry work. Throughout its history, it has faced many challenges posed by the business environment. Among them was the need for dynamic development, the need to be in step with the competition and the need for active monitoring and flexible adaptation to changes in the business environment, which has led to the constant change of business processes within the company.

Present We are a company that successfully combines tradition and continuous development with sustainability. As a foundry that devotes a great deal of attention to innovation and development, we have been able to take advantage of opportunities and bring our products and castings to the next level. We are a supplier of sophisticated technological solutions and quality castings used in various industries throughout Europe. We mostly supply castings used in the production of railway vehicles, agricultural machinery, construction machinery, mechanical engineering, production of pumps, fittings and valves and castings for construction.

Primary products:

- Brake discs
- Axel boxes

We are most proud of... We take great pride in our foundry work expertise, professionalism, many years of experience, innovative approach and use of modern technologies and equipment, as it allows us to provide our customers with highly demanding technological solutions and short delivery times. With recent investments we have increased our competitive advantage, the added value per employee and put our social responsibility to practice in the field of the environment. We have become the most modern foundry in Europe, and our state-of-the-art technology is in line with the best available techniques on the European market at the moment.

Vision We have combined the challenges of the past, the present and the future in a vision of a strategic plan to become a flexible, green manageable and efficient company in all areas of its operations. With the integration of new facilities into the production process of the foundry, we are looking to implement Industry 4.0, which will allow us full traceability and optimized control over the production process, technology, maintenance and energy.

Livar, d.d.

S prenovo poslovnih procesov na poti k podnebni nevtralnosti.
Towards climate neutrality by renovating our business process.

Naslov Address	Ljubljanska cesta 43, 1295 Ivančna Gorica
Spletni naslov Web Address	livar.si
Glavna dejavnost Core business	C24.510 Litje in obdelava izdelkov iz sive in nodularne litine // Grey and ductile iron casted and machined products
Št. zaposlenih Nr. of employees	577 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1954
Certifikati Certificates	IATF 16949, DB, EN 124-2, ISO 9001, ISO 14001
Ogljični odtis Carbon footprint	1,28 t CO_2ek/t proizvodnje // 1.28 t CO_2-eq/t production

Preteklost Naše bogate izkušnje so postavile trdne temelje in nam zagotovile neprecenljivo znanje, ki nam omogoča, da gremo naprej. Naši mejniki: 1954 – zagon kupolne peči in ustanovitev livarne Livar v Ivančni Gorici, 1974 - Livar s predelavo in instalacijo sodobnih električnih talilnih agregatov postane najsodobnejša livarna v tem delu Evrope, 1995 - Livar se združi z livarno in obdelovalnim podjetjem iz Črnomlja in postane »one stop shop« razvojni dobavitelj.

Sedanjost Smo zanesljiv partner za razvoj, proizvodnjo in obdelavo zahtevnih ulitkov iz sive in nodularne litine.

Glavni proizvodi:
- Izdelki iz sive in nodularne litine
- Sodobna mehanska obdelava ulitkov
- Lastna orodjarna, tehnologija in razvoj
- Lastna znamka komunalnega programa

Ponosni smo ... Smo ena izmed večjih livarn v Evropi z več kot 65-letno tradicijo. Smo partner najzahtevnejšim vodilnim evropskim in mednarodnim kupcem, vodilnim v različnih vejah industrij.

Vizija Postati prva izbira naših izbranih strateških strank za ulitke, obdelavo in montažo, ki temelji na motiviranih sodelavcih in centrih odličnosti.

Past Our vast experience has built a strong foundation and provided us with invaluable knowledge, which enables us to keep moving forward. Our milestones: 1954 - A cupola furnacelit for the first time ignited the establishment of the Livar foundry in Ivančna Gorica, 1974 – Livar becomes the most modern foundry in this part of Europe with the first electric melting agregates, 1995 – Livar merges with a foundry & machining company from Črnomelj and becomes a »one stop shop« casting supplier.

Present We are a reliable partner for development, production processing of advanced grey and nodular castings.

Primary products:

- Gray and nodular iron castings
- Modern machining of castings
- Own toolshop, technology and development
- Own brand of manhole covers and gratings

We are most proud of... Livar is one of the biggest European foundries, proud of more than 65 years tradition, a partner to the most demanding European and international customers, leaders in their branches.

Vision To become the first choice of our strategic partners for castings, processing and assembly, and be based on motivated workers and excellence centers.

Livarna Gorica d.o.o.

Skupaj za zeleni planet!
Together for a greener planet!

LIVARNA GORICA

Naslov Address	Cesta IX. korpusa 116, 5250 Solkan
Spletni naslov Web Address	li-go.si
Glavna dejavnost Core business	C24.510 Litje železa // Casting of iron
Št. zaposlenih Nr. of employees	35 (31. 12. 2020)
Velikost podjetja Company size	majhno // small
Leto ustanovitve Tradition since	1996
Certifikati Certificates	ISO 9001, ISO 14001
Ogljični odtis Carbon footprint	0,704 t CO_2ek/t proizvodnje // 0.704 t CO_2-eq/t production

Preteklost Začetki segajo v leto 1947, ko z obratovanjem začne Okrajno mehanično podjetje Solkan, v okviru katerega deluje livarna barvnih kovin. Leto dni kasneje iz kupolne peči priteče prvo železo. Izdelava form je ročna. Moderna zgodovina se začne leta 1996, ko livarno kupi E. ZÜRN in ustanovi podjetje LIVARNA GORICA. V naslednjih 25-ih letih sledijo številne posodobitve, ki zagotavljajo trajnostni razvoj podjetja in hkrati potrjujejo zaupanje nemških lastnikov v slovensko znanje in izkušnje zaposlenih.

Sedanjost Livarna Gorica je sodobna, uspešna, stroškovno učinkovita in na trgu trdno pozicionirana livarna sive litine s široko paleto izdelkov, programov, kupcev in trgov. Kupcem nudi preko tisoč različnih izdelkov med 0,5 in 24 kg v materialih EN-GJL 150 - 300. Specializirana je za izdelavo tankostenskih ulitkov jedrnega programa različnih oblik. Njen moto je, da le dolgoročno zadovoljstvo vseh njenih partnerjev - kupcev, dobaviteljev, zaposlenih in okolja, v katerem deluje, zagotavlja uspešno prihodnost.

Glavni proizvodi:
- Ohišja ležajev
- Deli motorja
- Ohišja črpalk
- Fitingi

Ponosni smo ... Ponosni smo na ekipo svojih zaposlenih, ki že četrt stoletja premaguje vse ovire, išče in ustvarja nove priložnosti in ob skrbi za okolje navdušuje svoje kupce in lastnike.

Vizija Livarna Gorica se v prihodnosti vidi kot uspešna, visoko avtomatizirana in digitalizirana livarna sive in nodularne litine, sposobna takojšnjega odziva na vedno nove zahteve trga, ki svojim kupcem nudi visoko kvalitetne, individualne rešitve. S stalnimi vlaganji v sodobno, okolju prijaznejšo tehnologijo, se livarna trajno umesti v prostor, v katerem deluje.

Past The first beginnings date back to 1947, when Okrajno mehanično podjetje Solkan with a non-ferrous metal foundry was founded. A year later, the first iron was produced in a dome furnace. Modern history began in 1996, when the foundry was purchased by E. ZÜRN resulting in the foundation of LIVARNA GORICA. During the next 25 years, a number of updates followed, ensuring the sustainable development of the company while confirming the trust of our German owners in Slovenian knowledge and experience.

Present Livarna Gorica is a modern, successful, cost-effective and market-positioned grey iron foundry with a wide range of products, programs, customers and markets. It offers over 1,000 different products between 0.5 and 24 kg in EN-GJL 150-300 materials. It specializes in the production of thin-wall castings of a core program of various shapes. Our motto: only long-term satisfaction of all partners; customers, suppliers, employees and environment in which it operates, ensures a prosperous future!

Primary products:

- Bearings housings
- Engine parts
- Pump housings
- Fittings

We are most proud of... We are proud of our team who has successfully overcome every obstacle in seeking and creating new opportunities, inspiring our customers and owners while respecting the environment.

Vision Livarna Gorica wants to be a successful, highly automated and digitized foundry of grey iron and ductile iron castings, capable of responding promptly to the ever-new demands of the market, offering its customers high-quality, individual and customer specific solutions. Constant investments in modern, environmentally friendly technology, place the foundry permanently in the local environnment.

Livarna TITAN, d.o.o.

Osnovne usmeritve razvoja bodo investicije v najsodobnejšo tehnologijo (industrija 4.0).
Future investments in achieving Industry 4.0 (robotization and automation).

Naslov Address	Kovinarska cesta 28, 1241 Kamnik
Spletni naslov Web Address	www.livarna-titan.eu
Glavna dejavnost Core business	C24.510 Ulivanje in obdelava ulitkov // A foundry of fittings and castings
Št. zaposlenih Nr. of employees	134 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1896
Certifikati Certificates	ISO 9001, DIN-DVGW, Zlata boniteta AAA // ISO 9001, DIN-DVGW, Gold Credithworthiness
Ogljični odtis Carbon footprint	3,7 t CO_2ek/t proizvodnje // 3.7 t CO_2-eq/t production

Preteklost Na parceli št. 718, kjer stoji danes Livarna TITAN, je imel svoj mlin posestnik Bučar. Svoje posestvo je skupaj z mlinom prodal češkemu inženirju Špaleku, ki je leta 1896 pričel z obrtniško proizvodnjo kovinske stroke. Leto 1896 tako štejemo za začetek Titana. Kasneje se je lastništvo livarne večkrat spreminjalo. Skokovit napredek je TITAN dosegel v letih 1933 - 1939. Maja 1945 je bila tovarna podržavljena, 2001 je postala hčerinska družba podjetja CIMOS, 2014 pa družinsko podjetje.

Sedanjost Livarna TITAN je uspešno podjetje, ki tekmuje na vedno bolj zahtevnem mednarodnem trgu. Proizvodni program zajema spojne elemente (fitinge) in naročniške ulitke iz kakovostne bele temprane litine. Livarna TITAN izvaža ulitke v preko 40 držav sveta. Zadnja leta potekajo velika vlaganja v novo, tehnološko napredno in okolju prijazno tehnologijo, s pomočjo katere širimo proizvodnjo, povečujemo kakovost in konkurenčno prednost ter dodano vrednost.

Glavni proizvodi:

- Fitingi - spojni elementi - beli temper
- Ulitki po naročilu iz bele temper litine

Ponosni smo ... Livarna TITAN ima bogato tradicijo proizvajanja visokokakovostnih livarskih izdelkov. Najbolj ponosni smo na našo 100 let trajajočo zgodbo, ki jo uspešno nadaljujemo.

Vizija Livarna TITAN, d.o.o. bo ostala med tremi vodilnimi proizvajalci kakovostnih izdelkov iz bele temper litine v Evropi. Naš razvoj bo temeljil predvsem na sistemu uveljavljanja in vpeljevanja novih, tehnološko naprednih in okolju prijaznih tehnologij in vlaganju v znanje in veščine zaposlenih.

Past On the title nu. 718, where today's Livarna TITAN stands, there was landowner Bučar's mill producing mineral dyes. He sold his possession to Czech engineer Špalek who, in 1896, started cottage industry of metal parts. Titan achieved huge progress in the years from 1933 to 1939, in May 1945, the factory was nationalised, 2001 became a subsidiary of CIMOS jsc in 2014 foundry became a family run business.

Present Today, Livarna TITAN is a successful company competing in an increasingly demanding international market. It's production portfolio includes fittings (connecting elements) and custom-made castings from quality whiteheart malleable cast iron. Livarna TITAN exports castings to over 40 countries all over the world, which represents about 90 % of its annual turnover.

Primary products:

- Threaded pipe fittings for water
- Order castings

We are most proud of... Livarna TITAN continues the long-lasting tradition, that was started many years ago. We are most proud of our 100 year long story, which we are successfully continuing.

Vision Livarna TITAN, d.o.o. will remain among the three leading manufacturers of castings from quality whiteheart malleable cast iron in Europe. In recent years, large investments have been made in new, technologically advanced and environmentally friendly technology, with the help of which we are expanding production, increasing product quality and competitive advantage and added value.

OMCO METALS Slovenia d.o.o.

Okolju prijazni.
Environmentally friendly.

Naslov Address	Cesta Žalskega tabora 10, 3310 Žalec
Spletni naslov Web Address	www.omcomould.com/
Glavna dejavnost Core business	C24.510 Livarstvo, modelarstvo, obdelava in trgovina // Foundry, pattern production, machining and sales
Št. zaposlenih Nr. of employees	164 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1990
Certifikati Certificates	ISO 9001, ISO 14001
Ogljični odtis Carbon footprint	0,001 t CO_2ek/eur prometa // 0.001 t CO_2-eq/eur income

Preteklost Podjetje je začelo s proizvodnjo zvonov, ki se je naprej razširilo v proizvodnjo različnih ulitkov. V nadaljevanju je v sodelovanju z OMCO International ohranilo del proizvodnje za črpalno tehniko in zvonove, obenem pa razvilo močno proizvodnjo kalupov za stekla.

Sedanjost Trenutno smo največja livarna v skupini OMCO in proizvedemo več kot 70 % ulitkov za skupino, obenem pa smo ohranili močno proizvodnjo drugih ulitkov, tako iz sive litine kot barvnih kovin.

Glavni proizvodi:
- Ulitki iz sive litine
- Ulitki iz alu brona

Ponosni smo ... Postali smo vodilni svetovni proizvajalec kalupov za embalažno steklo.

Vizija Skupaj s skupino ostajamo vodilni svetovni proizvajalec steklarskih kalupov, poleg tega pa pripravljamo zagon avtomatizirane proizvodnje ulitkov iz alu brona, namenjeni izdelavi grl. Stremimo tudi k ostalim kompleksnejšim ulitkom z višjo dodano vrednostjo.

Past The company started the production of bells, which further expanded into the production of various castings, then, in cooperation with OMCO International, maintained part of the production for pumping equipment and bells, and at the same time developed a strong production of glass moulds.

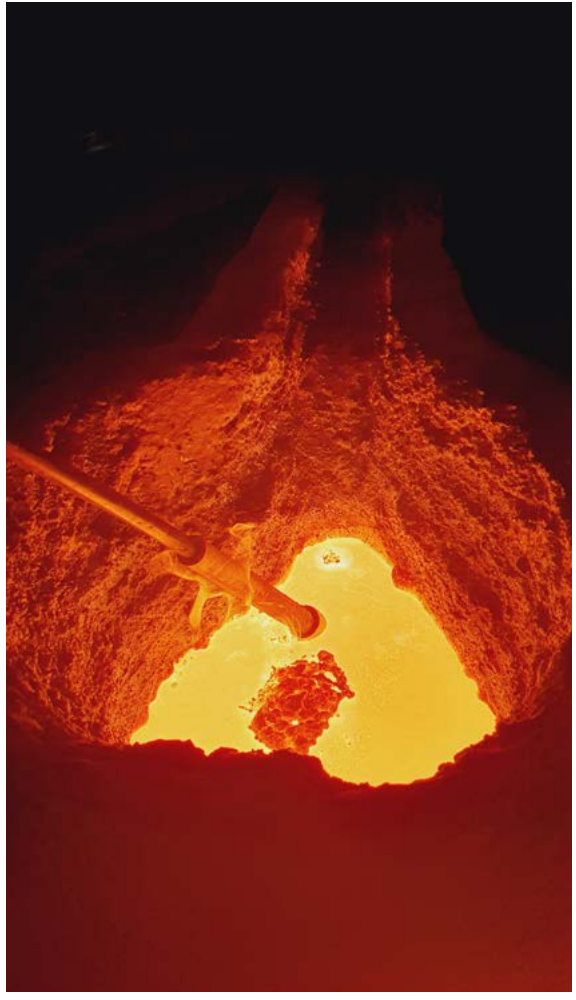
Present We are currently the largest foundry in the OMCO Group and produce more than 70 % of the castings for the group, while maintaining strong production of other castings, both from grey cast iron and non-ferrous metals.

Primary products:

- Castings from grey iron
- Castings from alu bronze

We are most proud of... We have become the world's leading manufacturer of glass moulds.

Vision With our group, we remain the world's leading manufacturer of glass moulds. Additionally, we are preparing to launch the automated production of aluminium bronze castings intended for neck ring manufacturing. We are oriented towards more other complex castings with a higher added value.



Gorenje Orodjarna, d.o.o.

Trajnostni prehod v nizkoogljično družbo z razumevanjem krožnega gospodarstva.
Sustainable transition to a low-carbon society with an understanding of the circular economy.

gorenje
Gorenje Orodjarna d.o.o.
a Hisense company

Naslov Address	Partizanska cesta 12, 3320 Velenje
Spletni naslov Web Address	www.gorenje-orodjarna.si
Glavna dejavnost Core business	C25.732 Proizvodnja orodja za stroje // Manufacturing of tools
Št. zaposlenih Nr. of employees	200 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1993
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001
Ogljični odtis Carbon footprint	0,0001 t CO_2ek/eur prometa // 0.0001 t CO_2-eq/eur income

Preteklost Začetek proizvodnje orodij v skupini Gorenje sega v leto 1953. Začetki so bili skromni, ekipa se je izpopolnjevala tako, da je sledila hitremu razvoju proizvodnje gospodinjskih aparatov v Gorenju, ki je postajala vse bolj globalna. Priložnost za še večjo rast smo v podjetju našli v avtomobilski industriji, ki je predstavljala nov zagon in podjetje postavila v sam vrh orodjarstva v Evropi. Smo največja orodjarna v Sloveniji in med večjimi v srednji in jugovzhodni Evropi.

Sedanjost Izdelujemo predvsem orodja za notranje dele avtomobilov, kot so sedeži in povezovalni deli. Delamo za vse nemške prestižne blagovne znamke (Audi, Daimler, BMW, Opel,...). Ni evropskega avtomobila, v katerem ni vsaj ene komponente, izdelane na naših orodjih. Imamo izvrstno usposobljene sodelavce. Posebej smo ponosni, da je mnogo sinov nekdanjih in sedanjih delavcev Orodjarne zaposlenih pri nas – orodjarstvo se torej nekako prenaša iz roda v rod; na ta način smo ustvarili pripadnost družbi.

Glavni proizvodi:
- Orodja za preoblikovanje pločevine
- Orodja za brizganje materialov
- Serijska proizvodnja pločevinastih delov
- Merilni sistemi, avtomatizacija in industrijska oprema

Ponosni smo ... Proizvajamo najzahtevnejša orodja za proizvodnjo vrhunskih izdelkov s sodobno tehnološko opremo, skrbimo za nenehni razvoj zaposlenih ter spremljamo svetovne trende in novosti.

Vizija Še naprej bo v ospredju našega razvoja avtomobilska industrija. Vizija podjetja je biti proizvajalec najzahtevnejših orodij za avtomobilsko industrijo. S pomočjo metod sočasnega inženiringa in vključevanja v razvoj izdelkov želimo s svojim znanjem pripomoči k iskanju optimalnejših razvojnih in tehnoloških rešitev in s kupci graditi dolgoročno partnersko sodelovanje.

Past Officially the production of tools in Gorenje Group began in 1953. The beginnings were modest and the team attended educational and training courses in order to keep up with the rapid development of domestic appliance production in Gorenje, which was becoming increasingly global. They found an opportunity for further growth in automotive industry, which gave the company a new boost and put it to the forefront of toolmaking in Europe. We are now the biggest toolmaking facility in Slovenia and one of the biggest in Central and Southeast Europe.

Present We make tools for internal car parts, which includes seats and connecting parts. We work for all the German prestigious car brands (Audi, Daimler, BMW, Opel …). Every single European car contains at least one part manufactured with our tools. We have excellently qualified staff. We are especially proud of the fact that several sons of former and existing employees of Orodjarna now work at our company – toolmaking is passed from one generation to the next and their loyalty to our company is the key to success.

Primary products:

- Tools for Sheet Metal Forming
- Injection moulds for Thermoplastic Materials
- Serial Production of Sheet Metal Parts
- Measuring Systems, Automation and Industrial Equipment

We are most proud of… We manufacture the most complex tools for the production of prestigious products with state-of-the-art technological equipment, we take care of the constant development of employees and monitor global trends and innovations.

Vision The automotive industry will continue to be at the forefront of our development. The company's vision is to be a manufacturer of the most demanding tools for the automotive industry. With the methods of simultaneous engineering and involvement in product development, we want to use our knowledge to offer more optimal technological solutions and build long-term partnerships with customers.

MAGNETI LJUBLJANA, d.d., Ljubljana

Razvojno, krožno, zeleno, pametno, kreativno, energetsko učinkovito.
Developmental, circular, green, smart, creative, energy efficient.

Naslov Address	Stegne 37, 1000 Ljubljana
Spletni naslov Web Address	www.magneti.si
Glavna dejavnost Core business	C25.990 Proizvodnja trajnih magnetov // Manufacture of permanent magnets
Št. zaposlenih Nr. of employees	239 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1951
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001

Preteklost Podjetje je bilo ustanovljeno leta 1951. Prvih dvajset let je proizvodnja tekla samo za jugoslovanski trg. Od leta 1995, po uspešno končani privatizaciji, podjetje s svojo vizijo in strategijo poslovanja dosega zastavljene cilje. Iz uspešnega proizvajalca magnetov za potrebe domače industrije je podjetje na podlagi pridobljenih standardov kakovosti ISO 9001, ISO 14001, IATF 16949 in standarda varnost in zdravje pri delu ISO 45001 ter kakovosti izdelkov preraslo v uspešno evropsko podjetje.

Sedanjost Podjetje je razvojno, tržno usmerjeno, inovativno, finančno stabilno in poslovno uspešno. Podjetje je vključeno v več mednarodnih razvojnih projektov na področju uvajanja krožnega gospodarstva za našo panogo na specifičnem področju porabe in ponovne uporabe okoljsko in strateško občutljivih surovin. Podjetje intenzivno vlaga v projekte za dvig energetske učinkovitosti in digitalne transformacije, kjer se odpirajo možnosti novih delovnih mest za visoko strokovne kadre.

Glavni proizvodi:
- Sintrani in liti AlNiCo magneti
- Sintrani SmCo magneti (SmCo5, Sm2Co17)
- Sintrani NeFeB magneti
- NeFeB plastomagneti na osnovi PA in PPS

Ponosni smo ... 70-letna tradicija, znanje, razvoj, inovativnost, poslovna odličnost, kvaliteta, usmerjenost h kupcu, bogate izkušnje, kompetentni zaposleni, trajnostni razvoj.

Vizija Vizija podjetja je ostati uspešno in prepoznavno podjetje na področju proizvodnje trajnih magnetov v Evropi. Cilji poslovanja podjetja temeljijo na razvoju podjetja, kakovosti, konkurenčnosti proizvodov ter povečani dodani vrednosti na zaposlenega. Temeljni strateški cilj in vidik trajnostnega razvoja podjetja, ki je hkrati tudi naša prednost pred konkurenco, pa ostaja še naprej naša stalnica: zadovoljevati zahteve kupcev tako glede kakovosti kot količine in dobavnih rokov.

Past The company was founded in 1951. During the first twenty years, the company only produced for the Yugoslav market. Since 1995, after the successful completion of privatization, the company has been achieving its goals with its vision and business strategy. From a successful manufacturer of magnets for a domestic market, the company has grown into a successful European company on the basis of the acquired quality standards ISO 9001, ISO 14001, IATF 16949 and the standard of ISO 45001.

Present Magneti is a development and market oriented, innovative, financially stable and business-successful company. It is involved in several international development projects in the field of the circular economy specifically for our industry, consumption and reuse of environmentally and strategically sensitive raw materials. The company invests in projects to increase energy efficiency and digital transformation opening new jobs for highly professional staff.

Primary products:

- Sintered and cast AlNiCo magnets
- Sintered SmCo magnets (SmCo5, Sm2Co17)
- Sintered NeFeB magnets
- PA na PPS bonded NeFeB magnets

We are most proud of... 70-years of tradition, knowledge, development, innovation, business excellence, quality, customer orientation, rich experience, competent employees, sustainable development.

Vision Magneti's vision is to remain a successful and recognizable company in the field of production of permanent magnets in Europe. The company's business goals are based on company development, quality, product competitiveness and increased added value. The basic strategic goal of the company and the aspect of sustainable development of the company, which is also our advantage over competition, remains the same; to satisfy customer requirements in terms of quality, quantity and delivery.

TPV AUTOMOTIVE d.o.o.

Ustvarjamo mobilnost zelene prihodnosti.
Creating mobility of the green future.

TPV AUTOMOTIVE

Naslov Address	Kandijska cesta 60, 8000 Novo mesto
Spletni naslov Web Address	www.tpv-automotive.si
Glavna dejavnost Core business	C29.320 Proizvodnja sestavnih delov vozil // Manufacture of vehicles parts
Št. zaposlenih Nr. of employees	728 (31. 12. 2020)
Velikost podjetja Company size	veliko // large
Leto ustanovitve Tradition since	1989
Certifikati Certificates	IATF 16949, ISO 9001, ISO 14001, ISO 45001, ISO 27001

Preteklost Podjetje TPV d.d., ki se je 2020 preimenovalo v TPV AUTOMOTIVE d.o.o., je bilo ustanovljeno leta 1989 kot delni naslednik družbe IMV. Naše korenine tako segajo še dlje, v leto 1954, ko je bila ustanovljena Motomontaža, prehodnica IMV. Leta 1992 smo kot eni od pionirjev robotizacije v proizvodnjo vpeljali prvega robota, leta 1996 pa vzpostavili lastno razvojno-raziskovalno organizacijo. Leta 2018 smo kot razvojni dobavitelj pridobili enega največjih poslov v zgodovini slovenske avtomobilske industrije.

Sedanjost TPV AUTOMOTIVE je razvojni dobavitelj, delujoč na globalnem trgu avtomobilske industrije. Razvijamo in proizvajamo izdelke, ki pomembno vplivajo na vozno dinamiko, varnost, ekološkost in udobje pri vožnji, ter vpeljujemo nove tehnološke rešitve na področju električnih vozil. Našim razvojnim rešitvam zaupajo najzahtevnejši kupci s svojimi blagovnimi znamkami, kot so BMW, Mercedes Benz, Volvo, Rolls Royce, Jaguar, Renault idr. Naši proizvodni procesi so zasnovani po načelu pametnih tovarn.

Glavni proizvodi:

- Razvojno inženirske storitve
- Aluminijaste komponente e-mobilnosti
- Ultra lahke jeklene komponente
- Površinska zaščita

Ponosni smo ... Naši izdelki, ki jih razvijamo za najzahtevnejše proizvajalce vozil, pomembno vplivajo na izboljšanje vozne dinamike, varnosti, ekološkosti in udobja pri vožnji.

Vizija Skladno s svojo vizijo »Ustvarjamo mobilnost prihodnosti« se že uspešno dokazujemo v sklopu enega najmočnejših trendov v avtomobilski industriji – elektrifikacije vozil. Ustvarjamo rešitve, ki omogočajo varnejšo, učinkovitejšo in okolju prijaznejšo mobilnost. S svojimi izdelki kot tudi procesi prispevamo k trajnostnemu razvoju družbe. Svoje proizvodne procese oblikujemo po načelu pametnih tovarn. S takšnimi usmeritvami bomo nadaljevali tudi v prihodnje.

Past TPV jsc. (renamed to TPV AUTOMOTIVE ltd. in 2020) was established in 1989 as a partial successor to IMV. Our roots go back even further, to 1954, when IMV's predecessor Motomontaža was founded. As one of the pioneers of robotics, we introduced the first robot into production in 1992, and in 1996 we established our own research and development organization. As a development supplier, we were awarded one of the largest contracts in the history of Slovenian automotive industry in 2018.

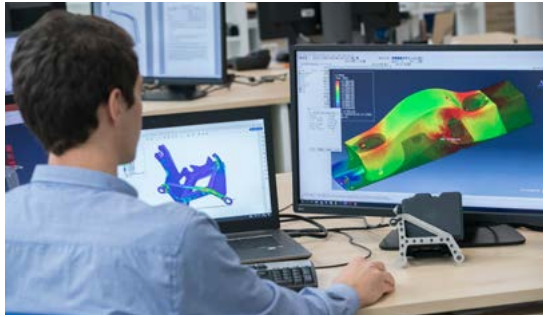
Present We are a development supplier operating in the global automotive market. We develop and manufacture products that significantly impact driving dynamics, safety, ecology, driving comfort and introduce new technological solutions in the field of electric vehicles. Our engineering services are trusted by globally recognized tier 1 suppliers and OEMs for their brands such as BMW, Mercedes Benz, Volvo, Rolls Royce, Jaguar, Renault. Our production processes are designed following smart factory trends.

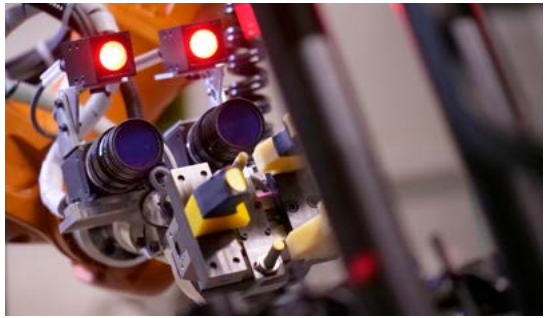
Primary products:

- Development & Engineering Services
- E-mobility Aluminium Components
- Lightweight Steel Components
- Surface Protection

We are most proud of... Our products, which we develop for the most demanding vehicle manufacturers, have a significant positive impact on driving dynamics, safety, ecology and driving comfort.

Vision In line with our vision »Creating mobility of the future«, we are already successfully participating in one of the strongest trends in the automotive industry - electrification of vehicles. We create solutions that enable safer, more efficient and more environment-friendly mobility. We contribute to the sustainable development with our products and processes. We follow the principle of smart factories and will continue to follow our vision in the future.



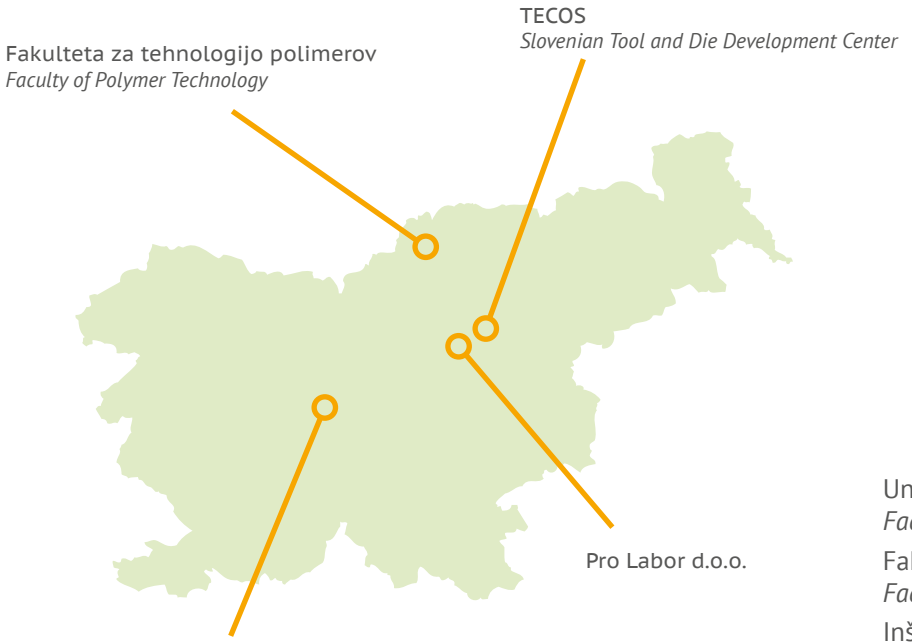


3. skupina: Inštitucije znanja in povezovanja

Organizacije z bogatim praktičnim in teoretičnim strokovnimi znanjem, usmerjene v raziskave, razvoj in inovativnost ter prenos znanj so neobhoden podporni steber podjetjem na poti v nizkoogljičnost. Pri slednjem imajo veliko in odgovorno vlogo tudi organizacije, ki oboje povezujejo.

3rd group Knowledge institutions and networking

This group presents organisations with rich practical and theoretical scientific knowledge, oriented towards research, development and innovativeness with knowledge transfer. They are an indispensable supporting pillar to companies wishing to decrease their GHG emissions. Organisations networking both stakeholders are also important.



- Univerza v Ljubljani, Naravoslovnotehniška fakulteta
  Faculty of Natural Sciences and Engineering
- Inštitut za kovinske materiale in tehnologije
  Institute of Metals and Technology
- Kemijski inštitut
  National Institute of Chemistry
- Gospodarska zbornica Slovenije
  Chamber of Commerce and Industry of Slovenia

3

Univerza v Ljubljani, Naravoslovnotehniška fakulteta Faculty of Natural Sciences and Engineering

Univerza v Ljubljani
Naravoslovnotehniška fakulteta
Oddelek za materiale in metalurgijo

Naslov Address	Aškerčeva cesta 12, 1000 Ljubljana
Spletni naslov Web Address	www.ntf.uni-lj.si/ntf/
Glavna dejavnost Core business	P85.422 Visokošolsko izobraževanje // Third stage of tertiary education
Št. zaposlenih Nr. of employees	170 (31. 12. 2020)
Leto ustanovitve Tradition since	2002

Naravoslovnotehniška fakulteta je članica Univerze v Ljubljani. Ustanovljena je bila leta 1994 in jo danes sestavljajo štirje oddelki, na katerih poteka raziskovalna in pedagoška dejavnost na šestih različnih področjih. Glavna dejavnost je univerzitetno izobraževanje na vseh dodiplomskih in podiplomskih nivojih študija ter raziskovalna dejavnost, razdeljena na oddelke in njihove inštitute. Raziskovalci so razdeljeni v trinajst raziskovalnih skupin, registriranih pri ARRS. Na fakulteti deluje pet programskih skupin, ki jih financira Ministrstvo za izobraževanje, znanost in šport. Temeljne in aplikativne raziskave potekajo v okviru nacionalnih projektov ali neposredno z industrijo in v okviru različnih evropskih programov. Rezultati raziskovalnega dela so predstavljeni na vrhunskih konferencah in v priznanih mednarodnih revijah.

Oddelek za materiale in metalurgijo na Naravoslovnotehniški fakulteti Univerze v Ljubljani izobražuje strokovnjake na področju materialov in metalurgije. Visokošolsko izobraževanje ima dolgo tradicijo vse od ustanovitve Univerze v Ljubljani leta 1919. Cilj študijskih programov je usposobiti strokovnjake, ki se bodo znali vključevati v realne industrijske procese in bodo lahko na osnovi naravoslovnih in inženirskih znanj obravnavali, analizirali in načrtovali nove materiale in tehnologije. Študij poteka v okviru naslednjih študijskih programov:

- **Inženirstvo materialov**, univerzitetni študijski program 1. stopnje,
- **Metalurgija in materiali**, univerzitetni študijski program 2. stopnje,
- **Metalurške tehnologije**, visokošolski program 1. stopnje in
- **Znanost in inženirstvo materialov,** doktorski študijski program 3. stopnje.

Študenti med študijem sodelujejo tudi pri raziskovalnih projektih, povezanih z gospodarstvom. V okviru programa Erasmus+ pa lahko en letnik ali semester opravijo tudi na eni izmed tujih univerz. Povezovanje diplomantov Oddelka za materiale in metalurgijo poteka v okviru kluba ALUMNI OMM.

Pedagoško in znanstveno-raziskovalno delo poteka v okviri šestih kateder, ki predstavljajo osnovne stroke:

- Katedra za inženirske materiale,
- Katedra za livarstvo,
- Katedra za metalografijo,
- Katedra za metalurško procesno tehniko,
- Katedra za preoblikovanje materialov,
- Katedra za toplotno tehniko.

Temeljne in aplikativne raziskave na področju razvoja novih naprednih materialov in metalurških tehnologij potekajo v okviru nacionalnih in evropskih projektov ter neposredno z industrijo.

The Faculty of Natural Sciences and Engineering is a member of the University of Ljubljana and was founded in 1994. It consists of four departments with research and educational activities in six different fields. The main activity is university education at all undergraduate and postgraduate levels and is divided into departments and institutes. Researchers are divided into thirteen research groups registered with ARRS. There are five program groups in the Faculty funded by the Ministry of Education, Science and Sport. Basic and applied research is carried out within the framework of national projects or directly with industry and within the framework of various European programs. The results of the research work are presented at high-profile conferences and in renowned international journals.

The Department of Materials and Metallurgy at the Faculty of Natural Sciences and Engineering at the University of Ljubljana educates experts in the field of materials and metallurgy. Higher education has a long tradition since the foundation of the University of Ljubljana in 1919. The aim of the study programs is to educate experts who are able to integrate into real industrial processes and discuss, analyze and plan new materials and technologies on the basis of natural and engineering knowledge. The study takes place within the framework of the following study programs:

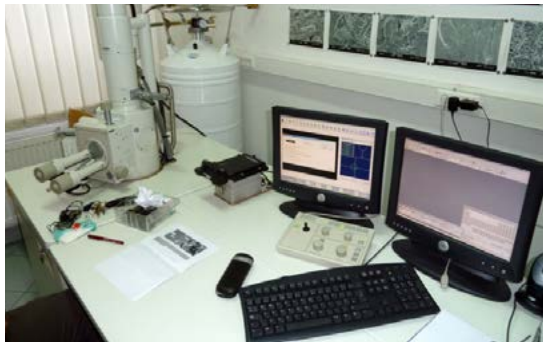
- **Materials Engineering**, bachelor's degree, 1st level university study programme,
- **Metallurgy and Materials**, master's degree, 2nd level university study programme,
- **Metallurgical Technology**, bachelor's degree, 1st level higher professional programme and
- **Science and Technology of Materials**, doctoral degree, 3rd university study programme.

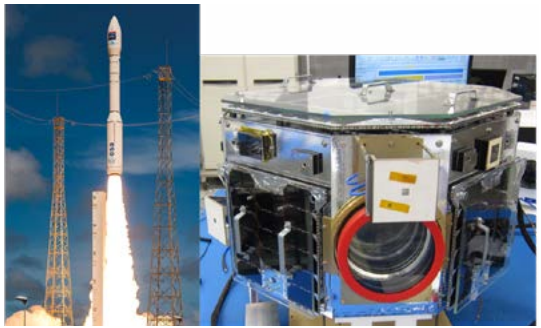
During their studies, students also participate in research projects related to business. Under the Erasmus + program, students can also spend a year or a semester at a foreign university. The connection of graduates of the Department of Materials and Metallurgy takes place within the framework of the ALUMNI OMM Club.

Educational and scientific-research work takes place within six departments, which represent basic professions:

- Chair of Engineering Materials,
- Chair of Foundry,
- Chair of Metalography,
- Chair pf Metalurgical Processing Techniques,
- Chair of Materials Forming,
- Chair of Heat Engineering.

Basic and applied research in the field of the development of new advanced materials and metallurgical technologies is carried out in the framework of national and European projects and directly with industry.





Fakulteta za tehnologijo polimerov
Faculty of Polymer Technology

Plastika ni kriva.
Krivi so neodgovorni uporabniki.
Plastic is not the problem,
what you choose to do with is.

FTPO
Fakulteta za tehnologijo polimerov

Naslov Address	Ozare 19, 2380 Slovenj Gradec
Spletni naslov Web Address	www.ftpo.eu/
Glavna dejavnost Core business	P85.422 Visokošolsko izobraževanje // Third stage of tertiary education
Št. zaposlenih Nr. of employees	19 (31. 12. 2020)
Velikost podjetja Company size	majhno // small
Leto ustanovitve Tradition since	2006

Preteklost FTPO s sedežem v Slovenj Gradcu je bila ustanovljena 30. 11. 2006 kot Visoka šola za tehnologijo polimerov, 8. 2. 2017 pa se je preoblikovala v Fakulteto za tehnologijo polimerov. Je zasebni visokošolski zavod, njeni ustanovitelji so Mestna občina Slovenj Gradec, RRA Koroška d.o.o., GIZ Grozd Plasttehnika, Adient Slovenj Gradec d.o.o., Grammer Automotive Slovenija d.o.o., TECOS, Razvojni center orodjarstva Slovenije, Plastika Skaza d.o.o., Kopur d.o.o. in BSH, Hišni aparati d.o.o. Nazarje.

Sedanjost FTPO je edina v Sloveniji, ki ponuja vsebinsko zaključen študij na področju polimernih tehnologij in materialov. Trenutno na fakulteti študira 143 študentov. Fakulteta nudi aplikativno, razvojno in raziskovalno podporo pri projektih s področja polimernih materialov in tehnologij. Razvojna in raziskovalna dejavnost temelji na najsodobnejši raziskovalni opremi in strokovnjakih, ki jih odlikujejo vrhunsko znanje o materialih in tehnologijah ter mnoge izkušnje iz gospodarstva.

Glavni proizvodi:
- Študijski programi in usposabljanja
- Mehanska / termična / kemijska karakterizacija
- Tehnologije predelave polimerov in orodja
- Sinteza polimerov, testi okolskih vplivov

Ponosni smo ... Ponosni smo na visoko zaposljivost naših diplomantov, najsodobnejšo laboratorijsko opremo, vrhunske strokovnjake, kakovostne storitve za podjetja, sodelovanje v številnih raziskovalnih projektih.

Vizija Fakulteta za tehnologijo polimerov bo z zagotavljanjem spodbudnega študijskega okolja, inovativnimi raziskavami ter vrhunskimi storitvami za partnerje iz industrije postala mednarodno priznana tehniška fakulteta in center odličnosti na področju tehnologije polimerov.

Past FTPO based in Slovenj Gradec was established 30. 11. 2006 as a Polymer Technology College, 8. 2. 2017 it was transformed into the Faculty of Polymer Technology. It is a private higher education institution, its founders are: the Municipality of Slovenj Gradec, RDA Koroška ltd., GIZ Cluster Plasttehnika, Adient Slovenj Gradec ltd., Grammer Automotive Slovenija ltd., TECOS, Slovenian Tool and Die Development Centre, Plastika Skaza ltd., Kopur ltd. and BSH, Home Appliances ltd. Nazarje.

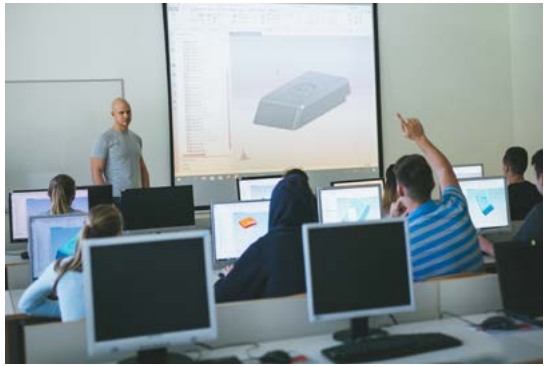
Present FTPO is the only institution in Slovenia offering a content-based study in the field of polymer technologies and materials. Currently, 143 students are studying at the Faculty. The Faculty offers applied, development and research support in projects in the field of polymer materials and technologies. R&D activity is based on state-of-the-art research equipment and experts, distinguished by top knowledge of materials and technologies and many experiences from the economy.

Primary products:

- Study programs and trainings
- Mechanical / thermal / chemical characterization
- Polymer processing technology and tools
- Polymer synthesis, environmental impacts

We are most proud of... High employability of our graduates, state-of-the-art laboratory equipment, top experts, quality services for industry and participation in many research projects.

Vision By providing a vibrant learning environment, inspiring innovative research, and outstanding value for partners from the industry, the Faculty of Polymer Technology (FTPO) shall become an internationally recognized technical faculty and Centre of Excellence for Polymer Technology.



Inštitut za kovinske materiale in tehnologije Institute of Metals and Technology

Kovinski materiali, še posebej jeklo in aluminijeve zlitine, so popolnoma reciklabilni.
Metallic materials, particularly steel and aluminum alloys are completely recyclable.

Naslov Address	Lepi pot 11, 1000 Ljubljana
Spletni naslov Web Address	www.imt.si/
Glavna dejavnost Core business	M72.190 Raziskave in razvoj // Research and development
Št. zaposlenih Nr. of employees	64 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1948

Preteklost Inštitut za kovinske materiale in tehnologije je javni raziskovalni inštitut, ustanovljen leta 1948 kot del Univerze v Ljubljani, Fakultete za rudarstvo in metalurgijo, ki je postal neodvisen leta 1954 in leta 1997 razglašen za javno raziskovalno ustanovo.

Sedanjost Inštitut za kovinske materiale in tehnologije (IMT) je javni raziskovalni zavod, ki prvenstveno raziskovalno, pa tudi pedagoško deluje na področju kovinskih materialov in tehnologij. Primarna naloga inštituta je ustvarjanje novega znanja predvsem na področju kovinskih materialov in varstva okolja v povezavi s kovinskimi materiali. Njegova sekundarna naloga je prenos ustvarjenega novega znanja v prakso za potrebe proizvodnih gospodarskih družb, termo in nuklearne energetike, s ciljem izboljšanja kakovosti življenja in trajnostnega razvoja. Inštitut je vpet v slovenski, evropski in tudi svetovni prostor in sodeluje s tujimi vrhunskimi raziskovalnimi skupinami ter s svetovno metalurško industrijo.

Glavni proizvodi:

- Temeljne in aplikativne raziskave ter prenos znanja
- Projekt MARTINA (MAteRiali in Tehnolog(I)je za Nove Aplikacije), financiran iz evropskih strukturnih skladov, ki združuje 16 partnerjev iz industrije in akademske sfere
- Projekt ČMRLJ (Doseganje Čistosti in lastnosti z MikRo Legiranjem Jekel), financiran iz evropskih strukturnih skladov, ki združuje 6 partnerjev iz industrije in akademske sfere
- Izdajanje znanstvene revije Materiali in tehnologije, ki ima faktor vpliva 0,697

Ponosni smo ... Najsodobnejša raziskovalna oprema, ki omogoča celoten ciklus od sinteze kovinskih materialov, preoblikovanja in toplotne obdelava, vse do mikrostrukturnih, mehanskih in korozijskih preiskav. Še posebej pa smo ponosni na sodelavce, ki so pripadni inštitutu in s svojo strokovnostjo ter predanostjo sodelujejo v številnih domačih in tujih projektih.

Vizija Vizija IMT je ostati najuspešnejši na področju razvoja, raziskav in inovacij kovinskih materialov v Sloveniji ter biti kompetenten, ugleden in odgovoren partner v trajnostnem razvoju družbenega okolja. IMT bo ohranjal in razvijal vlogo vodilnega inštituta na področju kovinskih materialov, ki bo s svojimi raziskavami, razvojem, inovacijami in prenosom znanja v industrijo ter izobraževanjem strokovnjakov prispeval h gospodarski rasti, zaposlovanju in blagostanju naše države tudi kot članice EU. Z najboljšimi sistemi vodenja in ključnimi strateškimi znanji bo IMT zagotavljal nenehno preseganje pričakovanj zaposlenih, poslovnih partnerjev in okolja ter ustvarjal privlačne priložnosti za zaposlitev najboljših kadrov.

Past The Institute of Metals and Technology is a public research institute established in 1948 as a part of the University of Ljubljana, Faculty of Mining and Metallurgy, which became independent in 1954 and declared as a public research institution in 1997.

Present The Institute of Metals and Technology (IMT) is a public research institute that primarily conducts research and pedagogy in the field of metallic materials and technologies. The primary task of the institute is to create new knowledge mainly in the field of metallic materials and environmental protection in connection with metallic materials. Its secondary task is to transfer the generated new knowledge into practice for the needs of manufacturing companies, thermal and nuclear energy, with the aim of improving the quality of life and sustainable development. The Institute is involved in Slovenian, European and the worldwide research and cooperates with top international research groups and the global metallurgical industry.

Primary products:

- Basic and applied research and knowledge transfer
- The MARTINA project (Materials for New Applications) is funded by the European Structural Funds and brings together 16 partners from industry and academia
- The ČMRLJ project (Achieving Cleanliness and properties with Micro Alloying of steel) is financed by the European Structural Funds and brings together 6 partners from industry and academia
- Publication of the scientific journal Materials and Technologies, which has an impact factor of 0.697

We are most proud of... State-of-the-art research equipment that enables the entire cycle from the synthesis of metallic materials, plastic deformation and heat treatment, all the way to microstructural, mechanical and corrosion tests. We are especially proud of our colleagues who are dedicated to the institute and participate with their professional knowledge in many domestic and international projects.

Vision IMT's vision is to remain the most successful Institute in Slovenia in the field of development, research and innovation of metallic materials and to be a competent, reputable and responsible partner in line with sustainable development. IMT will maintain and develop the role of a leading institute in the field of metallic materials, which will contribute to the economic growth, employment and prosperity of our country as an EU Member through its research, development, innovation and transfer of knowledge to industry and the education of experts. With the best management systems and key strategic skills, IMT will ensure that it continuously exceeds the expectations of employees, business partners and the environment, and creates attractive employment opportunities for the best staff.

Kemijski inštitut
National Institute of Chemistry

Z vrhunskimi raziskavami premikamo meje znanosti.
Moving the boundaries of science through excellent research

Naslov Address	Hajdrihova 19, 1001 Ljubljana
Spletni naslov Web Address	www.ki.si
Glavna dejavnost Core business	M72.190 Raziskave in razvoj // Research and development
Št. zaposlenih Nr. of employees	374 (31. 12. 2020)
Leto ustanovitve Tradition since	1946
Certifikati Certificates	ISO 9001

Preteklost Kemijski inštitut je bil ustanovljen leta 1946 kot Kemijski laboratorij Slovenske akademije znanosti in umetnosti. Leta 1953 je postal samostojna raziskovalna organizacija, leta 1992 pa javni raziskovalni zavod, katerega ustanoviteljica je bila Republika Slovenija, soustanovitelja pa Univerza v Ljubljani in Slovenska akademija znanosti in umetnosti.

Sedanjost Kemijski inštitut danes deluje kot javni raziskovalni zavod in opravlja znanstveno in raziskovalno-razvojne dejavnost na področju kemije in sorodnih disciplin.

Osnovne in aplikativne raziskave, ki potekajo na inštitutu, so usmerjene na področja dolgoročnega pomena tako za Slovenijo kot v svetovnem merilu: raziskave materialov, raziskave na področju ved o življenju, biotehnologija, kemijsko inženirstvo, strukturna in teoretična kemija, analizna kemija in varstvo okolja.

Industrija je pomemben partner Kemijskega inštituta. Razvoj novih tehnologij in izdelkov poteka v sodelovanju z mnogimi slovenskimi in tujimi podjetji. Cilj inštituta je povečanje sodelovanja z industrijo in povečanje inovativnosti raziskovalcev inštituta.

Izobraževalna dejavnost sodi med pomembna področja delovanja Kemijskega inštituta.

Podiplomski študenti predstavljajo okrog 25 % vseh zaposlenih, s čimer se Kemijski inštitut uvršča med pomembne ustanove na področju podiplomskega izobraževanja in usposabljanja.

Glavni proizvodi:
- Osnovne in aplikativne raziskave
- Izobraževanje
- Sodelovanje z gospodarstvom

Ponosni smo ... da z vrhunskimi raziskavami premikamo meje znanosti. S kreiranjem trendov soustvarjamo industrije prihodnosti in s prenosom znanja na mlade vzgajamo raziskovalce naslednje generacije. Sodelujemo z najboljšimi globalnimi raziskovalnimi institucijami, skupinami in posamezniki in svojim zaposlenim zagotavljamo navdihujoče delovno okolje.

Vizija Kemijski inštitut je znanstveno odlična, uveljavljena in prebojna raziskovalna ustanova v evropskem prostoru. S svojimi vrhunskimi raziskavami bogatimo svetovno zakladnico znanja in sodelujemo pri reševanju najbolj perečih izzivov družbe. Zdravje, trajnostna energija, podnebne spremembe, krožno gospodarstvo in varna hrana so najpomembnejši med njimi. Svoje raziskovalne cilje merimo v presežkih, ki premikajo meje v znanosti in ustvarjajo nove vrednosti. Znanje uspešno prenašamo v industrijsko okolje in tako dolgoročno podpiramo umeščenost znanosti v razvoj družbe. S svojim poslanstvom prispevamo k blagostanju širše slovenske družbe in smo zgled za odličnost. Predani znanosti želimo postati najboljši na svetu.

Past The National Institute of Chemistry was established in 1946 as the Chemical Laboratory of the Slovenian Academy of Arts and Sciences. In 1953 it became an independent research organization, and in 1992 a public research institute founded by the Republic of Slovenia and co-founded by the University of Ljubljana and the Slovenian Academy of Arts and Sciences.

Present Today, the National Institute of Chemistry is a public research institute carrying out scientific and research and development activities in the field of chemistry and related disciplines.

Basic and applied research are oriented towards fields which are of long-term importance for both Slovenia and the world: materials science, life sciences, biotechnology, chemical engineering, structural and theoretical chemistry, analytical chemistry and environmental protection. Activities carried out at the Institute are in line with the needs of the domestic and foreign industries and with the priority thematic areas of the EU Research and Innovation programme.

Industry is an important partner to the Institute. Development of new technologies and products is carried out in close collaboration with a number of Slovenian and international companies with whom the Institute has a long-term relationship. The aim of the Institute is to increase cooperation with industry and increase the innovation of the institute's researchers.

Education is among the key areas of the institute. Graduate students receiving their training at the Institute represent about 25% of the Institute's staff members, making National Institute of Chemistry one of the leading Slovenian organizations for graduate-level education and training.

Primary products:

- Basic and applied research
- Education
- Cooperation with industry

We are most proud of... Spushing the boundaries of science through cutting edge research to co-create the industries of the future. We empower the next generation of scientist through education and collaboration. We enable our scientific excellence through collaboration with the best global research institutions, groups and individuals. We provide our employees with inspiring working conditions in which they can carry out their professional mission.

Vision The National Institute of Chemistry is a scientifically excellent, established and breakthrough research institution based in Europe. With our cutting-edge research, we are enriching the global treasury of knowledge by solving the most pressing challenges facing society including: health, sustainable energy, climate change, a circular economy and safe food. Our research goals push the boundaries of science and create new values. We successfully transfer knowledge to industry and, in the long-term, support the role of science in the development of society. We aim to become the best in the world through our devotion to science.

Pro Labor d.o.o.

Z optimizacijo proizvodnje do podnebne nevtralnosti.
Production optimization for climate neutrality.

Naslov Address	Podvin 20, 3310 Žalec
Spletni naslov Web Address	www.prolabor.si/
Glavna dejavnost Core business	M72.190 Raziskave, razvoj in tehnološka optimizacija v proizvodnji // Research, development and technological optimization
Št. zaposlenih Nr. of employees	3 (31. 12. 2020)
Velikost podjetja Company size	mikro // micro
Leto ustanovitve Tradition since	2008

Preteklost Podjetje Pro Labor d.o.o. je bilo ustanovljeno zaradi potreb na trgu. Prepoznali smo potrebo po posebni vrsti poslovnega znanja v različnih industrijah, v katerih smo do tedaj delovali. Tako se je porodila ideja o svetovalnem podjetju, ki lahko ciljno podpira proizvodna podjetja z optimizacijo procesov in raziskovalno-razvojnim delom z visoko izobraženo in kompetentno ekipo, ki ima skupaj več kot 30 let izkušenj dela v težki industriji.

Sedanjost V podjetju smo specializirani za projekte, ki zahtevajo zelo ciljno usmerjeno znanje in za katere v podjetjih običajno ni dovolj časa ali aktivacijske energije. V podjetja naših kupcev prinesemo neobremenjen pogled, ki ga nadgradimo z večletnimi izkušnjami. Uspešno povezujemo znanost in industrijo. Znanstvene rešitve vpeljujemo v proizvodnjo. Projekte speljemo od idejne zasnove do implementacije v proizvodnjo in tako podpiramo naše partnerje od začetka do konca.

Glavni proizvodi:
- Optimizacija proizvodnih procesov
- Optimizacija izdelkov (jekleni, orodja)
- Natančen izračun lastne cene izdelkov

Ponosni smo ... Podjetje Pro Labor d.o.o. je postalo v Sloveniji in širši regiji sinonim za vrhunsko metalurško tehnološko in raziskovalno-razvojno znanje in izkušnje.

Vizija Podjetje Pro Labor d.o.o. namerava v prihodnosti nadgraditi svoje storitve s poudarkom na zeleni in digitalni prihodnosti. Radi bi postali še močnejši partner pri optimizaciji procesov v eni od energetsko najbolj intenzivnih industrij. Dodatno želimo povezati partnerska podjetja z inovativnimi novimi tehnologijami, ki so že dosegljive na trgu in ki jim bodo pomagala transformirati njihove procese za bolj zeleno prihodnost našega planeta.

Past Pro Labor ltd. was founded in line with market demand, as we recognised the need for business know-how of a certain type in the various industries we encountered on the market. This gave us the idea to start our consultancy supporting industry with process optimization and knowledge development services. Our services provided by a highly educated and competent team with over 30 years of experience in total in the manufacturing industry.

Present We are a company specialized for projects with extremely goal orientated know-how, for which companies normally do not have enough time or activation energy. We offer our partners an unimpaired view and upgrade it with long term experience. We successfully bridge the gap between science and production. We bring scientific solutions to their realization in production. We provide input from the formulation of initial project ideas to actual project implementation in production supporting our partners from start to finish.

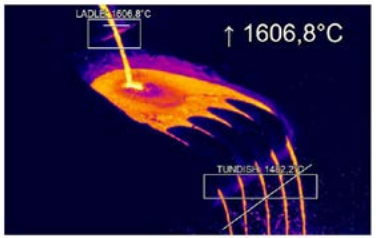
Primary products:

- Optimization of production processes
- Product optimization (steel, tools)
- Product cost calculation

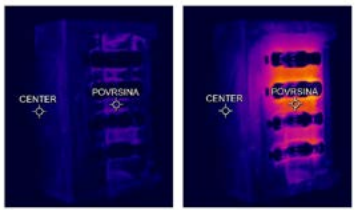
We are most proud of... The company Pro Labor ltd. has become a synonym for top know how and experience in the fields of metallurgical technology research and development.

Vision Pro Labor ltd. intends to upgrade its services emphasising a green and digital future. We want to become an even stronger partner in process optimization in one of the most energy intensive industries. Additionally, we want to present companies with innovative new technologies, available on the market helping them transform their processes for the greener future of our planet.

Meritve temperature tekoče taline



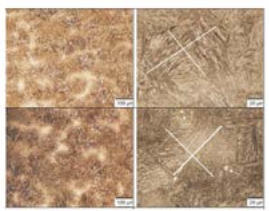
Meritve temperature orodja



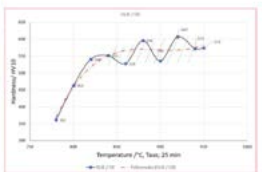
T_CENTER (0 min)= 38 °C
T_POVRSINA (0 min)= 46 °C

T_CENTER (10 min obratovanja)= 40 °C
T_POVRSINA (10 min obratovanja)= 67 °C

Ocena mikrostrukture



Meritev trdote



TECOS Slovenian Tool and Die Development Center

Soustvarjanje zelenih izdelkov in procesov.
Co-creation of green products and processes.

Slovenian Tool and Die Development Centre

Naslov Address	Kidričeva ulica 25, 3000 Celje
Spletni naslov Web Address	www.tecos.si
Glavna dejavnost Core business	M72.190 Razvoj izdelkov, optimizacija proizvodnje, raziskave // Product development, process optimisation, research
Št. zaposlenih Nr. of employees	22 (31. 12. 2020)
Velikost podjetja Company size	majhno // small
Leto ustanovitve Tradition since	1994
Certifikati Certificates	ISO 9001
Ogljični odtis Carbon footprint	0,00001 t CO_2ek/eur prometa // 0.00001 t CO_2-eq/eur income

Preteklost TECOS je tehnološki center, ustanovljen na pobudo slovenskih orodjarjev kot zavod zasebnega prava leta 1994.

Sedanjost Ponujamo lasten razvoj ter sledenje najbolj naprednim tehnologijam in znanstveno-raziskovalnim dosežkom ter njihovemu prenosu v industrijsko prakso na področjih orodjarstva in predelovanja materialov, tako polimernih kot tudi kovinskih. Pomagamo podjetjem z racionalizacijo poslovanja malih in srednje velikih podjetij v panogi z identifikacijo, vzpostavljanjem in uporabo skupne RR infrastrukture.

Glavni proizvodi:
- Razvoj izdelkov
- Simulacije brizganja polimerov
- 3D meritve
- Proizvodnja plastičnih izdelkov

Ponosni smo ... Smo dolgoročen strateški razvojni partner slovenskim in tujim podjetjem ter evropsko prepoznaven tehnološki center na področju razvoja novih izdelkov, orodij in tehnologij.

Vizija Naša vizija je postati dolgoročni strateški razvojni partner proizvodnim podjetjem kovinskopredelovalne in druge industrije v Sloveniji in širši regiji ter postati evropsko prepoznaven tehnološki center na področju razvoja novih izdelkov, orodij in tehnologij.

Past TECOS was established in 1994 on the initiative of Slovenian toolmakers as a non-profit organisation.

Present We offer development created inhouse and transfer of state-of-the-art scientific and technological knowledge into industrial practice. We help with business rationalisation in small and medium sized enterprises through joint R&D infrastructure.

Primary products:

- Product development
- Injection moulding simulation
- 3D measurment
- Production of plastic products

We are most proud of... We are a long-term partner for strategic development to Slovenian and foreign companies and a European-renowned technology center for new product development.

Vision Our vision is to become the long-term strategic development partner to production companies in Slovenia and the wider region. Furthermore, to become a renowned European technological centre for the development of new products, moulds and technologies.

Gospodarska zbornica Slovenije Chamber of Commerce and Industry of Slovenia

GZS - globalna, zelena, sodobna.
CCIS - Global, Green, Modern.

Gospodarska zbornica Slovenije
Chamber of Commerce and Industry of Slovenia

Naslov Address	Dimičeva ulica 13, 1504 Ljubljana
Spletni naslov Web Address	www.gzs.si/
Glavna dejavnost Core business	S94.110 Dejavnost poslovnih in delodajalskih združenj // Activities of business and employers membership organisations
Št. zaposlenih Nr. of employees	139 (31. 12. 2020)
Velikost podjetja Company size	srednje // medium
Leto ustanovitve Tradition since	1851

Gospodarska zbornica Slovenije (GZS) kot **reprezentativni predstavnik slovenskega gospodarstva** je mrežno organizirana in pokriva tako vse regije Slovenije kot tudi dejavnosti. Poleg lobističnih aktivnosti nudi širok nabor najrazličnejših storitev podpore poslovanju podjetij. Od prvih začetkov leta **1851** do danes ostaja rdeča nit zastopanje interesov članov in krepitev konkurenčnosti slovenskega gospodarstva.

Leta **1991** je GZS postala nacionalna zbornica samostojne države Slovenije. Članstvo v GZS je od leta **2006** prostovoljno, leta **2008** pa je GZS pridobila tudi status reprezentativne gospodarske zbornice. Na Vrhu slovenskega gospodarstva **2019** je GZS kot pobudnica skupaj s predstavniki institucij znanja in ministrstev podpisala posebno Izjavo za **Slovenijo 5.0** kot družbo trajnostnega razvoja, kjer bodo najsodobnejše tehnologije skupaj z usmerjenim družbenim razvojem pripeljale do **okoljske vzdržnosti in socialnega blagostanja**. Je **aktivna članica** v **Eurochambres**, **ICC** in mreži **NAAN** ter preko združenj in zbornic dejavnosti tudi v številnih **mednarodnih panožnih združenjih**.

V letu **2020** je GZS v sodelovanju s podjetji izvedla vrsto aktivnosti za ozelenitev zbornice in tako **pridobila**:

- **sončno elektrarno** na strehi v partnerstvu z GEN-i,
- 3 **polnilne postaje** MOON 9 in **e-avtomobil** za službene potrebe v partnerstvu s Porsche Slovenija,
- 4 **parkirna mesta** za vozilo AVANT2GO v partnerstvu z Avantcar,
- **e-kolesarnico** in **e-kolesa** v partnerstvu z Libera, Cafuta in projektom EDISON,
- **energetski monitoring** svoje poslovne stavbe v partnerstvu s Telekomom.

Na področju digitalizacije je bilo v letu **2020** uvedeno **brezpapirno poslovanje**, uvedena tehnologija **VPN Always ON** za delo na daljavo, implementacija orodij **Teams** in **Teams Live Events** ter operativni **center kibernetske varnosti**.

Vizija GZS je biti največja, najmočnejša in najvplivnejša povezava gospodarstva v Sloveniji, ki bo kot **globalna, zelena in sodobna** organizacija uspešno odgovarjala na sedanje in prihodnje gospodarske in družbene izzive.

As a **representative agent for the Slovene business community,** the Chamber of Commerce and Industry of Slovenija (CCIS) is organised in a web manner to cover both geographical regions as well as branch sectors within the country. In addition to lobbying activities, the Chamber supports the business community. Since its beginnings in the year **1851** to this modern day the backbone of the Chamber's activities has consisted of supporting the interests of its members and strengthening the competitiveness of the business community.

In **1991**, the Chamber became the national chamber of the independent state of Slovenia. Since **2006** membership has been voluntary. In **2008** the Chamber gained representative status. At the Summit of Slovenian Business in **2019**, the Chamber initiated the signing of a statement for Slovenia 5.0 and sustainable development together with representatives from institutions of knowledge and state ministries. The statement sets the way forward to **social prosperity and environmental sustainability** on the foundations of state-of- the art technologies and focused social development

The Chamber is active in the **Eurochambres**, **ICC** and **NAAN**. It is also active in numerous **international sectoral associations** through its branch associations and chambers.

In cooperation with its member companies, the Chamber executed many improvements in **2020** including the installation of

- **solar panels** on the roof of the Chamber building in partnership with GEN-i,
- 3 MOON **charging stations** for electrical cars and an **e-vehicle** in partnership with Porsche Slovenia,
- 4 **parking spaces** for AVANT2GO vehicles in partnership with Avantcar,
- Secure **e-bike storage** in partnership with Libera, Cafuta and the EDISON project, and
- **Monitoring energy consumption** of the Chamber's facilities in partnership with Telekom.

With regard to digitalisation, **paperless administration** was introduced in 2020, **VPN technology Always ON** was introduced to assist employees working from home. Digital tools **Teams** and **Teams Live Events** were adopted as was an operative Cybersecurity centre.

The chamber's vision is not only to be the biggest, strongest, and most influential network for the business community in Slovenia, but to also become a **global, green, and modern** organisation successfully addressing current and future business and social challenges.

SRIP MATPRO NA POTI K TRAJNOSTI

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Strateško razvojno-inovacijsko partnerstvo Materiali kot končni produkti (SRIP MATPRO)

Urednica:
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Redakcija:
Branka Murn

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Authors:
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SRIP MATPRO

Gospodarska zbornica Slovenije
Chamber of Commerce and Industry of Slovenia

EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA GOSPODARSKI RAZVOJ IN TEHNOLOGIJO

Operacijo delno financira Evropska unija iz Evropskega sklada za regionalni razvoj in Ministrstvo za gospodarski razvoj in tehnologijo. Operacija se izvaja v okviru Prednostne naložbe 1.2 »Spodbujanje naložb podjetij v raziskave in inovacije ter vzpostavljanje povezav in sinergij med podjetji, centri za raziskave in razvoj ter visokošolskim izobraževalnim sektorjem, zlasti s spodbujanjem naložb na področju razvoja izdelkov in storitev, prenosa tehnologij, socialnih in ekoloških inovacij, aplikacij javnih storitev, spodbujanjem povpraševanja, mreženja, grozdov in odprtih inovacij prek pametne specializacije ter podpiranjem tehnoloških in uporabnih raziskav, pilotnih linij, ukrepov za zgodnje ovrednotenje izdelkov, naprednih proizvodnih zmogljivosti in prve proizvodnje zlasti na področju ključnih spodbujevalnih tehnologij ter razširjanje tehnologij za splošno rabo«.

The investment is co-financed by the European Regional Development Fund and Ministry of economic development and technology of the Republic of Slovenia. The operation is implemented under Investment priority 1.2 »Promoting business investment in R&I, developing links and synergies between enterprises, research and development centres and the higher education sector, in particular promoting investment in product and service development, technology transfer, social innovation, eco-innovation, public service applications, demand stimulation, networking, clusters and open innovation through smart specialisation, and supporting technological and applied research, pilot lines, early product validation actions, advanced manufacturing capabilities and first production, in particular in key enabling technologies and diffusion of general purpose technologies«.