60 LET INŠTITUTA ZA KOVINSKE MATERIALE IN TEHNOLOGIJE

60 YEARS OF THE INSTITUTE OF METALS AND TECHNOLOGY

Metalurški inštitut Ljubljana (MI), predhodnik Inštituta za kovinske materiale in tehnologije je bil ustanovljen leta 1950 z odločbo Sveta za kulturo in prosveto LRS. Zaradi spremembe področja delovanja se je leta 1991 preimenoval v **Inštitut za kovinske materiale in tehnologije (IMT)**.

Temeljni kamen je bil postavljen leta 1947, ko se je začela gradnja stavbe MI. Metalurški inštitut je bil ustanovljen leta 1948 kot proračunska ustanova in sestavni del Tehniške visoke šole pri Fakulteti za rudarstvo in metalurgijo Univerze v Ljubljani. Leta 1950 je bila ustanovljena raziskovalna ustanova Metalurški inštitut Ljubljana, zagon majhnega eksperimentalnega plavža 1. 5. 1950 pa je bil znamenje za začetek dela.

Pobudnik ustanovitve MI in prvi direktor prof. Ciril Rekar, nestor slovenske metalurgije, je spodbujal tesno sodelovanje MI z oddelkom za metalurgijo Univerze v Ljubljani. Ves univerzitetni strokovni kader je bil dopolnilno zaposlen na inštitutu – v povojnih letih je bilo izrazito pomanjkanje strokovnega kadra, saj je bilo na ozemlju celotne države samo 35 metalurških inženirjev. Vojne izgube v vrstah metalurških inženirjev so bile velike, zato bi bilo zelo nesmotrno, da bi se preostali kader razdelil na pedagoški in raziskovalni del. Jasno je bilo tudi, da Univerza v Ljubljani brez raziskovalne dejavnosti ne bo dala dobrih metalurških inženirjev. Takratni politični vrh je predlagal, naj se univerza in raziskovalna ustanova združita, tako bo imel inštitut pomoč v mladih, šola pa naj bi bila povezana z metalurško prakso in raziskovalno-razvojnim delom, da ne bi postalo delo kabinetska učenost; tako je ob 15-letnici inštituta prof. C. Rekar zapisal: »Število diplomantov v raziskovalni dejavnosti MI postaja od leta do leta manjše in manj pomembno. Ne le našo metalurško šolo, temveč tudi druge nove oddelke zapušča vsako leto desetine metalurških inženirjev. S tem pa nastaja možnost, kakršne prej ni bilo, da more metalurški inštitut namestiti inženirje, ki imajo industrijsko prakso, in pa tiste mlade, ki imajo nagnjenje za osnovna znanstvena raziskovanja na metalurškem področju.«

Prav tako je prof. C. Rekar v nadaljevanju svojega poročila napisal: »Sodelovanje šole in inštituta je koristno za obe strani.«

Ob praznovanju 15-letnice je imel Inštitut 17 oddelkov s 123 zaposlenimi, od tega eno tretjino visokošolskega kadra, drugo so bili tehnični sodelavci in administracija; že takrat je direktor prof. C. Rekar poudarjal, da je premalo raziskovalnega kadra in preveč tehničnega osebja, za idealno si je zamišljal razmerje med raziskovalci in tehnično-administrativnim osebjem 1 : 1.

The Metallurgical Institute Ljubljana, predecessor of the Institute of Metals and Technology Ljubljana, was founded in 1950 with a decision of the Council for Culture and Civilisation of the PR of Slovenia. However, because of changes in the field of activity, in 1991 the name was changed to the **Institute of Metals and Technology**.

The cornerstone was laid in 1947, when the construction of the building of the MI was initiated. The institute was established as a budget institution and in 1948 as part of the High Technical School at the Faculty of Mining and Metallurgy of the University of Ljubljana. In 1950 the research was initiated with the start of work on a small blast furnace and 1 May 1950 is the initial date of activity.

The incentive for the founding of the MI was Prof. Ciril Rekar, who was also the first director of Metallurgical Institute Ljubljana and a supporter of a productive cooperation between the MI and the Dept. of Metallurgy of the University of Ljubljana. All the pedagogical workers were additionally engaged part time at the institute. In the years after the war there was a significant skills shortage, as only 35 metallurgical engineers worked in the territory of Slovenia. Because of the number of people lost during the war it was thought to be unwise for the remaining number of engineers to be distributed between the industry, pedagogical and research sectors. It was also clear that the University of Ljubljana would not educate good metallurgical engineers in the absence of any research activities. The political elite suggested joining the university and research institutions. In this way, the institute would acquire young people and the school connected the education with metallurgical practice and development work to prevent the change of the work to "cabinet science". At the 15th anniversary of the institute, Prof. C. Rekar wrote that the number of graduates in the research activity of the institute was becoming lower and less important as the number of graduate engineers from the Faculty and other university faculties increased. This created a previously nonexistent opportunity to employ at the institute a larger number of engineers with industrial experience and not only young graduates with a personal inclination towards basic research in the metallurgical field. In his report Prof. C. Rekar also stated that the cooperation of the faculty and the institute was useful for both sides.

At the celebration of the 15th anniversary the institute had 123 employees, one-third of them university graduates, and the majority of them technicians and administrative workers. Already on that occasion Prof. C. Rekar stated that the number of researchers was too small and that the number of lower-school degree employees was too great. He stated that 1:1 would be the ideal proportion between

Na podlagi temeljne uredbe je bil leta 1954 Metalurški inštitut razglašen za finančno samostojen zavod s sedežem v Ljubljani.

Z ukinitvijo fonda za napredek proizvodnje pri Zvezni industrijski komori in med formiranjem fonda za znanstveno delo je nastalo obdobje neurejenih dotacij in financiranja znanstvenih zavodov, kar je spričo stalno naraščajočih izdatkov tudi MI nekajkrat spravilo v neugoden finančni položaj. Udruženje jugoslovenskih željezara (UJŽ) je od Izvršnega sveta SRS prevzelo ustanoviteljske pravice in obveznost skrbeti za MI kot raziskovalno ustanovo železarske proizvodne panoge.

Leta 1973 je MI sporazumno s Sekretariatom za kulturo in prosveto ter ustanoviteljem UJŽ podpisal samoupravni sporazum o združevanju organizacij združenega dela v Slovenske železarne (SŽ), Ljubljana.

Ob 25-letnici MI je bil delež financiranja od takratne Raziskovalne skupnosti Slovenije (RSS) do 40 %, drugo pa so prispevale projektne naloge, ki so jih naročile slovenske železarne in kovinskopredelovalna industrija.

Inštitut se je vse bolj povezoval z metalurško industrijo, kar je bilo še bolj izrazito v obdobju od leta 1966 do 1986, ko ga je vodil direktor Alojz Prešern, univ. dipl. inž.

Šele v šestdesetih letih je bila dosežena taka kadrovska osnova, da so se lahko ustanavljali raziskovalni oddelki v metalurški industriji, ki so se povezovali z našim predhodnikom Metalurškim inštitutom in z Univerzo. Delo je usmerjala in nadzirala najprej posebna komisija, od leta 1970 dalje pa odbor za znanstvenoraziskovalno delo, ki ga je do devetdesetih let vodil dr. Marin Gabrovšek. Leta 1973 se je MI vključil v SŽ. Ob združitvi je MI ohranil svoj status osrednje raziskovalne institucije slovenske metalurgije in ga ohranil vse do osamosvojitve Slovenije.

Leta 1969 je MI kupil prvi elektronski mikroanalizator, ki pomeni začetek elektronske mikroanalize v slovenskem in širšem jugoslovanskem ter vzhodnoevropskem prostoru, kar pomeni tudi začetek tradicije predhodnika IMT – MI.

Neposredno povezovanje je dajalo celotni raziskovalno-razvojni dejavnosti (RR) usmeritve, delitev dela pa je opredeljevala vsebino in izvajalce temeljnih, aplikativnih in neposrednih raziskav za reševanje proizvodne, kakovostne in razvojne problematike. Tako se je v obdobju od 1986 do 1990 MI odločil in financiral eksperimentalno napravo za horizontalno kontinuirano litje specialnih zlitin. Izkazalo se je, da je bila investicija v izredno moderno in obetajočo polindustrijsko napravo za tisti čas in kraj povsem neprimerna in se je inštitut komaj izognil propadu.

Po osamosvojitvi Slovenije se je tudi slovenske metalurgije dotaknila gospodarska kriza, saj je proizvodnja od takratnih 800 000 ton jekla letno padla na 300 000 ton letno, zmanjšalo se je število zaposlenih na vsega 2650. V železarnah so povsod iskali možnosti za znižanje stroškov proizvodnje in kot prvo ukinili raziskothe numbers of researchers and the number of technical and administrative employees. At the 15th anniversary the institute had 17 departments.

After a government decision on financially independent institutions, the Metallurgical Institute became, in 1954, a financially independent institution with its location in Ljubljana.

With the closing of the Fund for the Progress of Production by the Federal Industrial Chamber and during the formation of the Federal Fund for Scientific Work a time of unsettled conditions for financing the work of scientific institutions was met and, because of increasing expenses, the institute found himself in a critical financial situation. The Union of Yugoslavian Steelworks (UJŽ) took over the funding rights and obligations from the Executive Council of the SRS and started to finance the MI as a research institution for the steel-producing industry.

In 1973 the MI signed, an agreement with the Secretary for Culture and Civilisation and the UJŽ the joining to the self-management company Slovenian steelworks Ljubljana.

At the 25th anniversary the funding of the Slovenian Republic was at 40 %, while the difference was acquired from projects for the Slovenian ironworks and different manufacturing industrial companies.

The research work of the institute strengthened constantly the connections with the metallurgical industry, even stronger in the years 1966 to 1986, with Eng. Alojz Prešern as the director.

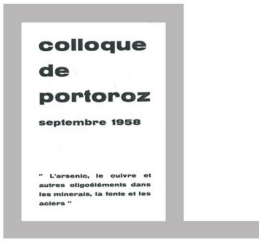
Only in the 1960s did the number of university graduates reach sufficient levels for the formation of research units in metallurgical companies that established good contacts with our predecessor and the University. The program of work was established first by a special commission, from 1970 by the Board for Research Work and Prof. M. Gabrovšek as the head. By joining with the Slovenian steelworks, the institute conserved the status of the central research institution of Slovenian metallurgy until the independence of Slovenia

In 1969 an electron probe microanalyser was acquired and the use of this advanced analytical device was started in Slovenia, Yugoslavia and in the Eastern European area and the germ for the quality growth of the predecessor of today's IMT was made possible.

Direct connections with the industrial sector gave a general direction to the whole research activity and the division of work determined the topics and the performers of basic, applied and basic research projects aimed at improving the quality of production and of products, development and the preparation of scientific articles. In relation to the expected development in the years 1986 to 1990, it was decided in 1990 to finance the acquisition and construction of an experimental unit for a horizontal half industrial continuous caster for special alloys. This decision was later found to be a great mistake as it was not suited to the time and place and the institute found itself in a very critical financial situation.

After the independence of Slovenia, Slovenian metallurgy faced a serious crisis and steel production decreased from about 800,000 tons to about 300,000 tons

POMEMBNI MEJNIKI V ZGODOVINI IMT



1947
Pričetek gradnje Metalurškega inštituta ob Marmontovi ulici, sedanji Jamovi cesti

1948
Metalurški inštitut (MI) je bil ustanovljen pri Tehniški visoki šoli z dekretom Sveta za prosveto in kulturo Ljudske republike Slovenije; glavni pobudnik prof. Ciril Rekar.

1950
Maj; odprtje prve zgradbe in zagon eksperimentalnega plavža na koks iz lignita

1952
Aprila je predal Privredni Savet FNRJ svojo raziskovalno enoto v Polju (oplemenitenje rud, hidrometalurgija, goriva) Metalurškemu inštitutu.

1954
Ustanovitelj Inštituta Izvršni svet Ljudske skupščine LRS (Uradni list št. 30-120/1954)

1958
Končana gradnja drugega trakta MI ob Lepem potu. 14. 8. 1958 (Uradni list št. 28/1958) postane MI znanstveni zavod kot samostojna pravna oseba. Izvršni svet LRS je za 10 let z Uredbo in pogoji (Ur. l. št. 28/58) prenesel ustanoviteljske pravice na Združenje jugoslovenskih železarn (UJŽ) iz Beograda, kjer je Inštitut zavzel mesto osrednje raziskovalne organizacije metalurške industrije Jugoslavije.
Colloque de Portorož 1.mednarodna konferenca v Jugoslaviji (MI , MPI, IRSID)

1959
Inštitut je z Max-Planck-Institutom für Eisenforschung, Düsseldorf, in IRSID, Francija, organiziral prvo mednarodno znanstveno konferenco v Jugoslaviji "Residuals and trace elements in iron and steel (Oligoelementi v železu in jeklu)".
Postavljen je bil reaktor na sončno energijo v Bernardinu, Portorož, in kasneje študijska koksarna MI-Laboratorij, Velenje, ter MI-Laboratorij za morsko korozijo v Moščeniški Dragi.

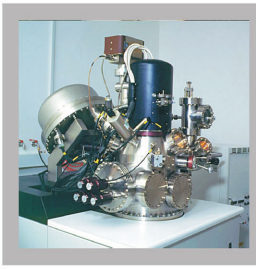
1961
Prične obratovati indukcijska vakuumska peč (20 kg).

1962
Zagon duo-valjarne Schmitz

1963
Nabava hladne izostatske stiskalnice za področje metalurgije prahov

1967
. Deuxième Colloque - 2. mednarodna konferenca (MI, MPI, IRSID)

1969
Prvi elektronski mikroanalizator Jeol v srednji in vzhodni Evropi in šolski transmisijski elektronski mikroskop (povečava do 6000-krat)



1971
Metalurški inštitut je imenovan za osrednjo raziskovalno ustanovo za metalurške raziskave Slovenije.

1973
27. 11. 1973 priključitev kot samostojna organizacija v SOZD Slovenske železarne (SŽ-MI)

1974
Zagon polindustrijske naprave za elektro pretaljevanje pod žlindro (EPŽ-ingoti do 300 kg)

1978
Postavljena sta bila vrstični elektronski mikroskop (SEM) Jeol JSM 35 in sodoben univerzalni preizkuševalni stroj (500 kN) za mehanska statična in dinamična preizkušanja (od 0 Hz do 200 Hz).

1981
International Conference: Residuals in iron and steel (MI, MPI, IRSID)

1984
Pričel je delovati procesni računalnik PDP 11.

1986
Postavitev peči za toplotno obdelavo orodnih jekel v vakuumu in dušiku

1989
Postavitev polindustrijskih naprav za taljenje in neprekinjeno litje drobnih profilov MIL-PP

1990
Preimenovanje Metalurškega inštituta v Inštitut za kovinske materiale in tehnologije (IMT)
Pričela je obratovati naprava za vodno atomizacijo kovinskih materialov.

1992
Inštitut je prevzel urejanje in izdajanje revije Železarski Zbornik, ki se je preimenovala v Kovine zlitine tehnologije in leta 2000 v Materiali in tehnologije.

1994
Pričele so se raziskave ionskega nitriranja v pulzirajoči plazmi.

1997
IMT se je preoblikoval v Javni raziskovalni zavod.

1998
Zagon sodobne naprave za analizo površin Microlab 310-F z analitskimi tehnikami FE-AES, SEM, SAM, XPS in REELS

2001
Ustanovitev nove raziskovalne skupine Vakuumistika z Laboratorijem za metrologijo tlaka ter Laboratorijem za vakuumsko znanost in optoelektroniko

2002
Razširitev merilnega območja Laboratorija za metrologijo tlaka

2003
Inštalacija analitskega mikroskopa Jeol 6500 F
Zagon naprave za merjenje majhnih hitrosti deformacije
Rekonstrukcija vakuumske peči Ipsen

2004
Zagon analitskega mikroskopa Jeol 6500 F z analitskimi tehnikami FESEM, ED/WD in EBSD

2005
Ustanovitev Centra odličnosti MODERNI KOVINSKI MATERIALI/ADVANCED METALLIC MATERIALS

2006
Nabava INSTRON 250 kN dinamični preizkuševanli stroj
Nabava presevnega vrstičnega elektronskega mikroskopa JEOL JEM 3010 FasTEM
IMT je postal pridruženi član Mednarodne podiplomske šole (MPŠ)

2007
Nabava Jeol SM09010 Cross section polisher in Jeol EM09100IS, ion slicer
Nabava Rockwell in Vickers merilnikov trdote
Ustanovitev Inštituta R&D Shtime
Proslava 40-letnice izdajanja revije MATERIALI IN TEHNOLOGIJE / MATERIALS AND TECHNOLOGY
Revija MATERIALI IN TEHNOLOGIJE / MATERIALS AND TECHNOLOGY sprejeta v Science Citation Index (SCI)

2008
Zagon presevnega vrstičnega elektronskega mikroskopa JEOL JEM 2100 HSR

2008–2009
Pričetek podiplomskega izobraževanja Napredni kovinski materiali v okviru MPŠ

2009
Zagon INSTRON 250kN

www.imt.si
imt@imt.si

Inštitut za kovinske materiale in tehnologije
Lepi pot 11
SI-1000 Ljubljana

valne oddelke. Enako se je zgodilo tudi v Impolu in Talumu, predelovalcema aluminija, propadla pa so mnoga podjetja. S tem pa sta tako Metalurški inštitut kot tudi univerza izgubila sogovornike v industriji. Nalog, ki so jih naročale SŽ oziroma druga metalurška podjetja, je bilo vse manj in Metalurški inštitut si je moral najti druge vire financiranja in se udejstvovati v drugih vejah industrije; poleg tega pa je prenehal delovati tudi velik jugoslovanski trg. MI je pod vodstvom takratnega direktorja prof. Vodopivca našel svojo nišo predvsem v kovinskopredelovalni industriji in v termoenergetiki. Zaradi svoje nove dejavnosti in pritiska javnosti ter politike, »da metalurgija nima v Sloveniji nobene prihodnosti«, se je Metalurški inštitut leta 1991 preimenoval v Inštitut za kovinske materiale in tehnologije – IMT. Takrat se je Metalurški inštitut razdelil na IMT in na proizvodni del Metalurški inštitut Ljubljana-pilotna proizvodnja MIL-PP. Število zaposlenih na IMT se je zmanjšalo od 110 na 60 sodelavcev. IMT je s svojim znanjem o materialih postal partner Nuklearne elektrarne Krško (NEK) in Termoelektrarne Šoštanj (TEŠ) ter drugih slovenskih elektrarn. Raziskovalci IMT pa so se intenzivno ukvarjali s temeljnimi in aplikativnimi raziskavami o materialih in uspešno konkurirali na javnih razpisih resornega ministrstva v programu NRP kot tudi v subvencijah Ministrstva za znanost in tehnologijo (MZT) gospodarskim organizacijam, kar je bil tudi skromen začetek ponovnega sodelovanja s slovensko metalurgijo.

Prelomnica v zgodovini inštituta je bilo leto 1997, ko je postal javni raziskovalni zavod, ustanovitelja pa sta bila MZT in z eno tretjino Slovenska industrija jeka (SIJ). V tem obdobju so se na inštitutu ustanovili novi laboratoriji, npr. Laboratorij za fizikalno metalurgijo površin, ki je opremljen z moderno aparaturo za raziskavo površin in »in situ« prelomov kovinskih materialov in kompozitov, Laboratorij za lezenje, v katerem so moderne naprave, narejene na inštitutu po zgledu tujih iz razvitega dela Evrope.

Na inštitutu je bil leta 2000 ustanovljen Laboratorij za tlak in dve leti kasneje akreditiran kot nosilec nacionalnih etalonov za celotno območje tlaka od 10^{-9} mbar do 2000 bar. Leta 2000 je bila ustanovljena nova raziskovalna skupina *Vakuumistika in tehnologije.*

V letu 2003 smo kupili najsodobnejši elektronski mikroanalizator, analitski mikroskop, prvi s Schottkyjevim izvirom elektronov v slovenskem prostoru in ga naslednje leto instalirali.

V letu 2004 je inštitut ustanovil Center odličnosti (CO) Moderni kovinski materiali, ki je bil namenjen prenosu znanja v industrijo in razvoju regij ter predvsem posodobitvi raziskovalne infrastrukture. V CO je poleg inštituta še pet partnerjev iz gospodarstva in javne sfere.

Inštitut je nabavil visoko ločljiv presevni elektronski mikroskop z energijsko disperzijskim spektrometrom za analizo in STEM-enoto, ki omogoča vrstično presevno mikroskopijo, skupaj z napravami za pripravo vzorcev;

per year and the number of employees in the companies decreased to about 2650. In the companies a reduction in production costs was sought and one of the first steps was the closing of the research units. At the same time the evolution of the companies Impol and Talum, producers of aluminium and aluminium alloys occured. A number of other companies were closed. This was followed by a decrease in the number of contacts of the institute and the faculty with industrial companies and the institute was obliged to find other financial support, as the Yugoslavian market was also lost.

Director at that time, Prof. F. Vodopivec, found the MI place in the metals manufacturing industry and producers of electricity in steam power plants. Because of the change of activity and political pressure that "metallurgy has no future in Slovenia" in 1991 the institute changed its name to the Institute of Metals and Technology (IMT) and divided into two parts: IMT and the production unit MIL-PP. The number of employees was reduced from 110 to 60. The knowledge of metallic materials enabled a cooperation with such partners as Nuclear Power Plant NEK Krško and Steam Power Plant Šoštanj, other electric energy-producing companies and a number of small companies. The researchers continued their work on basic and other topics and were successful in obtaining financing also from the ministry responsible for research and development. They were also associated in projects for industrial companies in the frame of the NRP program. This program was also the slow initial move for a new cooperation with the Slovenian metallurgical industry.

The turning point in the institute's history is the year 1997, when it was officially declared a public research institution with the founders being two-thirds the Ministry of Science and Technology and one-third the company Slovenian Steel Industry. After this year, new laboratories were established, for example, the Laboratory for the Physical Metallurgy of Material Surfaces, with advanced equipment for surfaces and the "in situ" examination of the fracture of materials; and the Creep Laboratory with devices of our own design and construction for the testing of creep deformation. In 2000 the Laboratory for Pressure was established, which 2 years later received an accreditation for holding the national etalons for pressure in the range of 10^{-9} mbar to 2000 bars. In 2000 a new research group was established with the name Vacuum Science and Technology. In 2003 a very sophisticated electron-probe microanalyser was acquired, the fist analytical microscope with a Schotky source of electrons in the Slovenian area, and installed in the following year.

In 2004 the Centre of Excellence Modern Metallic Materials was established, dedicated for the transfer of knowledge to industry and the development of regions; first of all, the modernisation of the research infrastructure. As part of this centre, the institute is associated with five partners from industry and the public sphere.

The institute acquired a high-resolution transmission electron microscope with an energy-dispersive spectrometer used for analysis and an STEM device for scanning transmission microscopy. It also acquired devices for the

kovinske materiale je namreč potrebno stanjšati na debelino 7 nm. JEM HR 2100 je bil instaliran v letu 2008.

Tako je postal inštitut eden najmodernejših centrov za raziskave strukture kovinskih materialov od površine (AES, XPS) do nano- in mikrostrukture (JSM 6500F-FE-SEM z ED/WD in EBSD-tehnikami) ter strukture na atomski skali (JEM 2100 HR, STEM in EDS ter z možnostjo segrevanja vzorca in situ do 1000 °C) tako v slovenskem prostoru kot v svetu.

Prav tako smo iz sredstev strukturnih skladov Evropske unije (EU) kupili najnovejši dinamični 250 kN trgalni stroj s pripadajočo opremo za visokotemperaturne preizkuse in s priborom za lomno mehaniko. V letu 2009 smo prenovili delavniško halo v Mehanski laboratorij, kjer je instaliran nov trgalni stroj INSTRON, ter preselili že obstoječ trgalni stroj 500 kN in drugo obstoječo opremo. Tudi na področju mehanskih lastnosti kovinskih materialov smo po opremljenosti med vodilnimi v evropskem prostoru.

V letu 2006 je IMT pridobil akreditacijo za dva laboratorija, in sicer za metalografski in mehanski laboratorij ISO 17025.

Inštitut ima redno, dopolnilno in pogodbeno zaposlenih 60 sodelavcev, od tega 35 z visokošolsko izobrazbo (23 doktorjev znanosti, 1 magistra in univ. dipl. inž.) ter vzgaja 14 podiplomskih študentov in 5 novih študentov s Kosova ter BiH, ki so zaposleni na inštitutu ali pa se na inštitutu usposabljajo.

Inštitut se ponovno spopada s pomanjkanjem strokovnega kadra, je bilo zapisano ob 50-letnici. Podobno kot na vsej tehniki je tudi na metalurgiji in materialih premalo študentov kljub kadrovskim štipendijam in pripravljenosti industrijskih podjetij prispevati k vzgoji strokovnega kadra ter razpisanim štipendijam tehnološke agencije TIA.

Zaradi pomanjkanja visoko strokovnega kadra in zaradi nepripravljenosti Naravoslovnotehniške fakultete (NTF-OMM) na enakopravno sodelovanje, se je IMT 2006 leta pridružil Mednarodni podiplomski šoli Jožefa Stefana (MPŠ) in v študijskem letu 2008/2009 začel študijski program Napredni kovinski materiali (Advanced Metallic Materials) v okviru smeri Nanoznanosti in nanotehnologije. Tako je na podiplomskem izobraževanju na MPŠ/IMT vpisano 17 podiplomskih študentov, kar je izreden uspeh in dober obet za nove vrhunske kadre.

Julija 2010 je bil podeljen prvi doktorat, septembra dva magisterija, v decembru pa je zagovarjal svoje doktorsko delo prvi podiplomski študent s Kosova.

Inštitut si mora pridobiti do ene tretjine letnega proračuna na trgu, torej v industriji, kar pa v današnjem času ni enostavno. Zato je na pobudo Ministrstva za gospodarstvo začel delovati tudi na področju držav zahodnega Balkana, v BiH in na Kosovu. Tako smo realizirali projekt postavitve Laboratorija za metrologijo tlaka, katerega odprtje je bilo junija 2009 v Sarajevu na Meroslovnem inštitutu BiH. Projekt je financiralo Mini-

preparation of specimens, as it is necessary to decrease the thickness of specimens to 7 nm. The JEM HR 2100 equipment was installed in 2008.

This development transformed the institute for the investigation of the structures of metallic materials from the surface (AES, XPS) to the nanodimensions of the microstructure (JSM 6500F- FE-SEM z ED/WD and EBSD methods) and the structure on atomic scale (JEM 2100 HR, STEM and EDS) and the possibility of in-situ heating of the specimens up to 1000 °C.

With support from the EU structural funds an advanced dynamic tensile-testing device with a capacity up to 250 kN equipped for tests at high temperature and a determination of the fracture toughness was acquired. In 2009 the workshop hall was renovated and the Laboratory for Mechanical Testing and an INSTRON 500 kN tensile testing device were moved to the hall with the new testing machine. Also in the area of the testing of mechanical properties of materials IMT is positioned among the leaders in the European area.

In 2006 IMT obtained an accreditation for the Laboratories for Metallography and Mechanical Testing according to ISO 17025.

At the institute, 60 persons are employed as regular, complementary and contract persons. A total of 35 of them are university graduates (23 PhDs, 1 Masters and Engs.) and it educates 14 postgraduates and 5 new students from Kosovo and Bosnia & Herzegovina as employees or associates for education.

The institute meets a deficiency of professional skills, as stated already at the 50 years jubilee. Like all areas of technology, the institute is faced again with a scarcity of professional skills because the number of students of metallurgy and materials is too small, in spite of the scholarships and industrial companies funding the education of professional degrees in the officially published scholarships of the Agency for Technology (TIA).

Because of the deficiency of professional skills and the unwillingness of NTF-OMM to involve equal cooperation, in 2006 IMT joined the Jožef Stefan International Postgraduate School and started in the school year 2008/2009 with the program Advanced Metallic Materials in the frame of the topics Nanosciences and Nanotechnology. In the postgraduate studies Jožef Stefan IPS-IMT there are 17 students registered; this will result in success and great promise for the development of excellent professional skills. In July 2010 we had the first doctorate, in September two Masters degrees were achieved, and in December the first postgraduate from Kosovo obtain his doctoral degree.

The institute is obliged to find one-third of its annual budget from external sources, and of course obtaining funds from industry is not simple at this time. For this reason, and with encouragement from the Ministry of the Economy, we also started to be active in the area of the countries of the Western Balkans, BiH and Kosovo. In the frame of this activity the project for the foundation of the Laboratory for Pressure Metrology opened in June 2009 in Sarajevo at the Institute of Metrology of BiH. The project was financed by the Ministry of the Economy from funds

strstvo za gospodarstvo RS iz sredstev državne pomoči, za drugi projekt, prav tako za BiH, Električne veličine pa smo podpisali pogodbo 31. avgusta 2010.

Na Kosovu smo soustanovili raziskovalni inštitut R&D SHTIME, za katerega izobražujemo visoko strokovni kader: 8 študentov se je vpisalo na podiplomski študij MPŠ/IMT Advanced Metallic Materails, poleg tega sta še 2 študenta iz BiH.

Raziskovalci IMT si prizadevamo intenzivno sodelovati s kolegi strokovnjaki iz slovenske industrije pri njihovih vsakodnevnih problemih, predvsem pa pri razvoju novih izdelkov in pri optimiranju že uvedenih procesov in tehnologij s svojimi izkušnjami in znanjem s področja temeljnih in aplikativnih raziskav. Predvsem poskušamo animirati vodilne v podjetjih, da svoje mlade raziskovalce usmerijo na podiplomski študij; našo vlogo pa vidimo pri usposabljanju mladih raziskovalcev (MR) za industrijsko problematiko in delo na vrhunski raziskovalni opremi, ki je na razpolago na inštitutu.

Metalurški inštitut in kasneje Inštitut za kovinske materiale in tehnologije sta ves čas od ustanovitve dalje uspešno sodelovala s priznanimi mednarodnimi znanstvenimi institucijami; z nekaterimi je stike navezal že prvi direktor prof. Ciril Rekar, kot npr.: Max-Planck-Institut für Eisenforschung, Düsseldorf, in IRSID, Francija. Zelo dobro sodelujemo z National Institute for Standards and Technology – NIST, ZDA, ter z vrsto evropskih ustanov, s katerimi sodelujemo pri mednarodnih projektih, kot so COST, Eureka, projekt iz 4. OP Brite Euram-Hembot in pri petih projektih iz 5. OP, sodelujemo pri 6. OP in pri projektih Evropskega raziskovalnega sklada za premog in jeklo – RFCS ter pri projektih CEA – Comisariat energie Atomic.

Prav tako ne smemo pozabiti izdajateljske dejavnosti IMT: že leta 1992 smo prevzeli od predhodnika ACRONI, Železarne na Jesenicah, izdajanje Železarskega zbornika. Tradicionalno revijo smo posodobili in preimenovali v slovensko znanstveno revijo Kovine, zlitine, tehnologije. V letu 2000 je dobila revija današnjo obliko in ime **Materiali in tehnologije (MIT).** Veliki napori uredniškega odbora so pripeljali do tega, da je revija MIT citirana v SCIE od 1. januarja 2007 in v letu 2009 že beležila impact faktor IF 0.143.

Izdali smo tudi tri monografije avtorjev: Leopolda Vehovarja Korozija, Franca Vodopivca Kovine in zlitine ter Borisa Uleta Rešene naloge iz fizikalne metalurgije.

Poleg tega je predhodnik IMT-ja, Metalurški inštitut, organiziral vsako leto Posvet o metalurgiji in kovinskih gradivih; gonilna sila in vodja posveta je bil prof. Vodopivec. Leta 1990 se je v organizacijski odbor vključila M. Jenko in takrat smo začeli prirejati konference v hotelu Bernardin, ki je z leti prerastel v sodoben Kongresni center.

Že leta 1992 sta se pridružila glavnemu organizatorju konferenc IMT kot soorganizatorja Institut »Jožef Stefan« in Kemijski inštitut; glavni pobudniki so bili takratni direktor KI prof. Stane Pejovnik, prof. Drago

based on developmental support. The contract ratification for the second project, for BiH Electrical quantities, occurred on August 31 2010.

In Kosovo we cooperated in the founding of the research Institute R&D SHTIME, for which the professional cadres are educated: a total of 8 candidates registered for post-graduate study at IPS/IMT Advanced Metallic Materials, with two candidates from BiH being enrolled in the subject.

Researchers from IMT try hard to collaborate with colleagues from Slovenian industry by looking for solutions to daily problems and especially in the development of new products and improving processes and technology using our knowledge and experience from the fields of applied and basic research. We also try to encourage the companies to stimulate their young researchers to apply for postgraduate study and see our role in the education of young researchers to solve industrial problems using the top research equipment they have at their disposal at IMT.

The Metallurgical Institute, now the Institute of Metals and Technology, collaborates successfully with eminent international research institutions. The initial contacts were established by the first director, prof. Ciril Rekar, for example, the Max-Planck-Institut für Eisenforschung (MPIE) Germany and the Institut de Recherches de la Siderurgie (IRSID) France. Also, there is a collaboration with the National Institute for Standards and Technology (NIST), USA, and some European countries with cooperation in international projects: COST Eureka, a project from the 4th OP Brite Euram-Hembot, 5 projects from 5th OP, in the 6th OP in projects of the European Fund for Coal and Steel – RFCS and in a project with the CEA-Commisariat a l'Energie Atomique, France.

The publishing activity of the IMT should not be forgotten. Already in 1992 the institute took over from the predecessor, the company ACRONI Steelwork in Jesenice, the editing of the journal Železarski zbornik. This traditional journal was updated and renamed as the Slovenian scientific journal Kovine Zlitine Tehnologije – Metals Alloys Technologies. In the year 2000, the journal acquired its current form and the name **Materiali in Tehnologije – Materials and Technology.** The editorial board succeeded in achieving the citation of the journal in the ISI index SCIE from January 2007 and the journal achieved the IF of 0,143.

In addition, three monographs were printed: Leopold Vehovar Korozija (Corrosin), Franc Vodopivec Kovine in zlitine (Metals and Alloys) and Boris Ule Rešene naloge iz fizikalne metalurgije (Solved problems from Physical metallurgy).

The predecessor of IMT, the Metallurgical Institute, organized an annual conference on metallurgy and metallic materials. The driving force and the chairman of the conference was Prof. F. Vodopivec. In 1990 M. Jenko joined the organizing committee and then the conferences were organized in the Hotel Bernardin, which with years developed into a modern congress center.

Kolar z IJS in direktor IMT prof. Franc Vodopivec, ki so bili tudi pobudniki za formiranje raziskovalnega polja Materiali pri MVZT. Prof. Vodopivec je bil predsednik programskega odbora posveta in kasneje konference vse do svoje upokojitve 1996. leta. Posvet se je preimenoval v Konferenco o materialih in tehnologijah in letos smo končali že 18. po vrsti. Poleg vabljenih predavateljev je najbolj atraktivna sekcija Mladi raziskovalci – MR, kjer imajo mladi raziskovalci priložnost predstaviti v 10-minutnem govornem prispevku svoje delo v angleškem jeziku in se tako usposabljati za nastope na večjih mednarodnih konferencah ter obenem tekmovati za priznanje in simbolično nagrado. Letos je bilo 35 prispevkov mladih raziskovalcev, med njimi sta bila tudi dva mlada raziskovalca iz Karlove univerze v Pragi na Češkem ter univerze na Slovaškem. Vsa leta do sedaj je vodil sekcijo MR prof. dr. Stane Pejovnik, sedanji rektor Univerze v Ljubljani, kar si štejemo v posebno čast.

Doseženi uspehi, izkušnje in znanje iz preteklega obdobja so neprecenljiva osnova in velika obveza za prihodnost, vendar pa ne pomeni garancije za uspešnost. Samo neprestano prilagajanje novim razmeram tako v slovenskem kot v svetovnem merilu in iskanja novega, boljšega, z razvojem podprtega novega znanja omogočajo uspeh in napredek.

Lahko rečemo, da je v zadnjih 60. letih vse to IMT-ju in predhodniku MI-ju dobro uspevalo na njuni razvojni poti, na kateri so se tako izoblikovala zelo značilna obdobja, ki so obenem ogledalo razvoja metalurgije in kovinskih materialov v slovenskem prostoru in v svetu.

Zahvala gre vsem dosedanjim direktorjem, ki so zadnjih 60 let uspešno vodili MI oziroma IMT: prof. C Rekarju, ing. A. Prešernu, dr. J. Rodiču, prof. F. Vodopivcu, in prof. L. Vehovarju, kot tudi vsem stanovskim kolegicam in kolegom, ki so pomagali ustvarjati napredne zamisli. Posebna zahvala pa gre MVZT-ju, ARRS-u, Slovenski industriji jekla, Acroni-ju, Jesenice, Impolu, Slovenska Bistrica, Metalu Ravne, Štore-Steelu, Talumu, Kidričevo, Uniorju, Zreče, Univerzi v Ljubljani in Mednarodni podiplomski šoli Jožef Stefan, ki so pomagali Metalurškemu inštitutu in nato IMT-ju na poti do današnjega uspešnega inštituta.

V prihajajočih letih si želimo posodobiti še preostale laboratorije na inštitutu in jih opremiti z vrhunsko raziskovalno opremo, prenoviti stavbo ter urediti odnose z NTF-OMM, da bo omogočeno sodelovanje z univerzo pri vzgoji strokovnega kadra v duhu misli nestorja metalurgije prof. Rekarja: »Sodelovanje šole in inštituta je koristno za obe strani« ter še uspešnejšega sodelovanja z industrijskimi podjetji, predvsem v slovenskem prostoru. Poleg tega želimo vključiti mlajše raziskovalce v učni proces na vrhunskem podiplomskem izobraževanju na Mednarodni podiplomski šoli Jožef Stefan, pridobivati nove študente, ki bodo baza za vrhunski strokovni kader na področju kovinskih materialov.

Monika Jenko
direktorica

Already in 1992 the Jožef Stefan Institute and the National Institute of Chemistry joined IMT, with Prof. S. Pejovnik from NIC, Prof. D. Kolar from JSI and IMT Prof. F. Vodopivec as the organizers. They suggested the formation of the research field Materials (MVZT). Prof. F Vodopivec was also chairman of the program board of the conference up until his retirement in 1996. The conference was renamed as the Conference on Materials and Technology, and this year the 18th in the series was organized. Besides the invited speakers, the most attractive section is that for Young Researchers, where young researchers have the opportunity to present in 10 minutes oral presentations the results of their work in English and, in this way, acquire experience for talking at larger international conferences. Additionally, they compete for recognition and a symbolic award. This year, 35 young researchers presented their work, with two coming from the Carl University in Prague and from the technical University in Slovakia. So far, Prof. S. Pejovnik chaired the session for Young Researchers, which he also did this year, in spite of his tremendous obligations as the rector of the University of Ljubljana. His presence and work were a special honour for the conference.

The results obtained, the experience, and the knowledge are a valuable base and an obligation for the future. However, they are not a guarantee of success. Only the steady accommodation to the new conditions in Slovenia and the world and the search for new and better, as well as the development of new and open knowledge, may ensure our success and progress.

In the past 60 years IMT and its predecessor have had success and have mirrored the development of metallurgy in Slovenia and in the World. Thanks are due to all the past directors of the MI and IMT: Prof. C. Rekar, Eng. A. Prešern, Dr. J. Rodič, Prof. F. Vodopivec and Prof. L. Vehovar as well as to all the colleagues that helped us to realize progressive ideas. Special thanks are due also to MVZT, ARRS, the companies SIJ (Slovenian steel industry), ACRONI Jesenice, Impol Slovenska Bistrica, Metal Ravne, Štore-Steel, Talum, Kidričevo, Unior Zreče and the University of Ljubljana that assisted the institute in the development of today's successful institute.

In future years we will also update the other institute laboratories and provide them with advanced, high-quality research equipment, to renovate the building and to improve the relations with NTF-OMM to improve the cooperation with university in the education of a professional human resources in the spirit of Prof. C. Rekar: "The cooperation of the institute and the school is useful for both sides" and a better success in the cooperation with industrial companies, especially in the Slovenian area. We would like, also, to include young researchers in the topmost postgraduate education process at Jožef Stefan International Postgraduate School, to acquire new students as a basis of the future experts for the field of metallic materials.

Monika Jenko
director