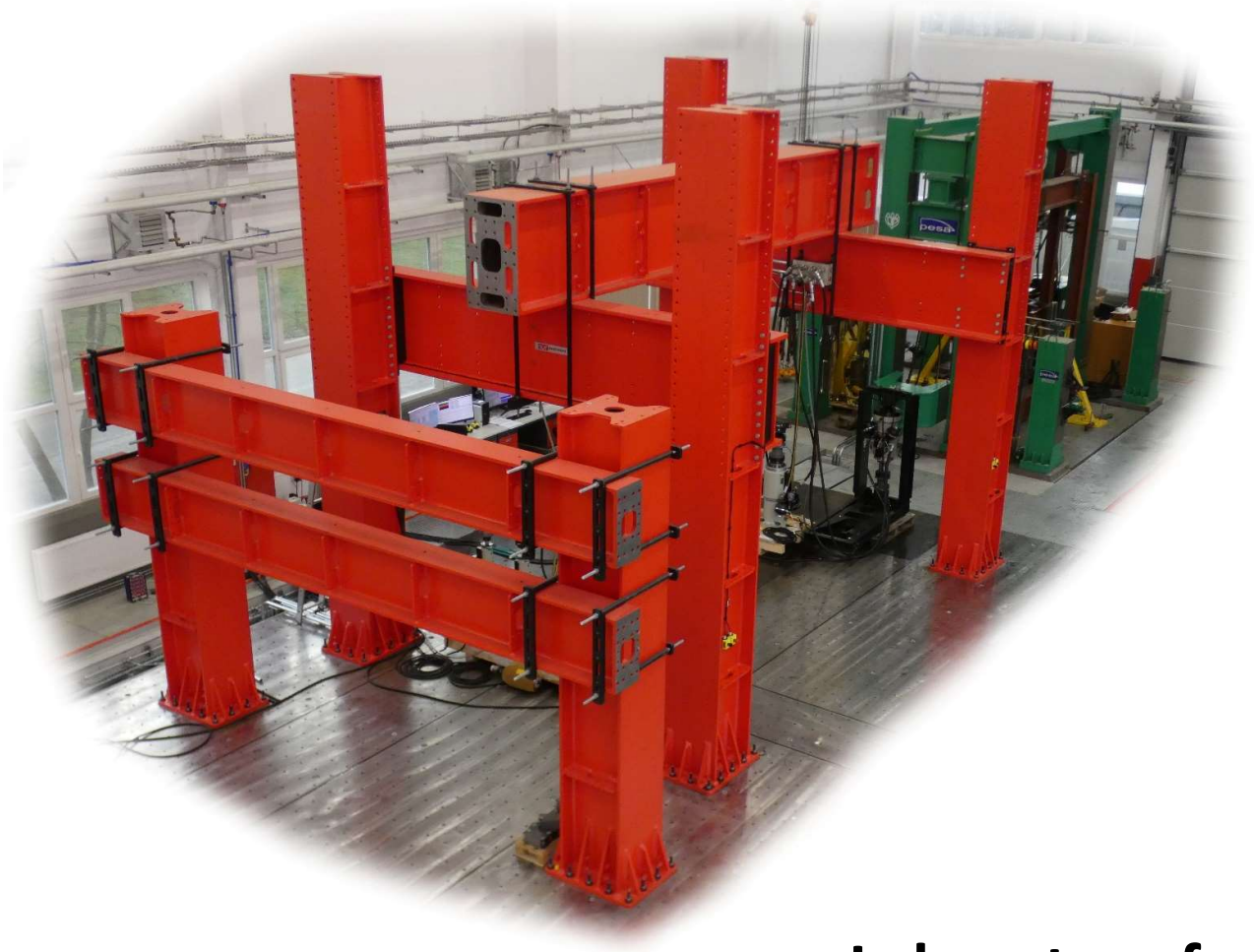
BYDGOSZCZ UNIVERSITY
OF SCIENCE AND TECHNOLOGY
Faculty of Mechanical Engineering

From university laboratory

to environmental laboratory



Laboratory for Research on Materials and Structures

Dear Readers,

The year 2021 was special for our community. It marked the 70th anniversary of the university, which from its very beginning has been educating engineers in various fields and specializations, meeting the needs of the city, region, and country. It is also the year when the uniwersity opens a new chapter in its history as the long-awaited Bydgoszcz Uniwersity of Technology.

At same time, the only fakulty that has been continuously operating since the beginning of the uniwersity - the Faculty of Mechanical Engineering - is celebrating its 70th anniversary. Witchin it, the Laboratory for Research on Materials and Structures that has been operating for 25 years, which additionally celebrates the 20th anniversary of obtaining accreditation from the Polish Centre for Accreditation this year. On this occasion, we present to you a commemorative folder dedicated to the history and achievements of the Laboratory.

The establishment of one of the first accredited laboratories at a state uniwersity is the result of a vision outlined over 20 years ago by PhD DSc Eng. ProfTit Józef Szala, Dr. h.c. PBŚ and PO, head of the former Department of Machine Design, and the work put in to obtain accreditation by the laboratory's head, Prof. Stanisław Mroziński, and his colleagues.

The directions of development adopted by the management of the Laboratory for Research on Materials and Structures have always been in line with the needs of companies in the region, and consistent investment and promotional activities have resulted in the fact that now both leading companies in the region and the country with research and development departments, as well as companies that do not have such facilities, use its services.

From the very beginning, the laboratory's activities have been focused on cooperation with the broadly understood economic environment and constitute one of the best practical examples of the implementation strategy of the Bydgoszcz Uniwersity of Technology for 2021-2025. As a uniwersity, we want to be closer to entrepreneurs, monitor their research needs, and invite them to carry out joint projects.

I congratulate the management and employees of the Laboratory for Research on Materials and Structures on their success and achievements. I thank them for the effort they put into obtaining and maintaining accreditation. Their work, competencies, and experience gathered during this time are a essential element strengthening the economic potential of the city of Bydgoszcz and the Kuyavian-Pomeranian Voivodeship, thus promoting our most important asset, which is the Bydgoszcz Uniwersity of Science and Technology.

Rector of Bydgoszcz University of
Science and Technology

Marek Adamski PhD DSc Eng. ProfTit

it's been 20 years

POLSKIE CENTRUM AKREDYTACJI
POLISH CENTRE FOR ACCREDITATION

PCA

CERTYFIKAT AKREDYTACJI
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY
Nr AB 372

Potwierdza się, że: / This is to confirm that:

AKADEMIA TECHNICZNO-ROLNICZA
ul. Kordeckiego 20, 85-225 Bydgoszcz
LABORATORIUM PODSTAW KONSTRUKCJI MASZYN
ul. Kaliskiego 7, 85-763 Bydgoszcz

spełnia wymagania normy PN-EN ISO/IEC 17025:2001
meets requirements of the PN-EN ISO/IEC 17025:2001 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AB 372
Accredited activity is defined in the Scope of Accreditation No AB 372

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w kontrakcie Nr AB 372
This accreditation shall remain in force provided the Laboratory observes the requirements of Accreditation Body defined in the Contract No AB 372

Okres ważności certyfikatu akredytacji od 14.12.2001 r. do 13.12.2005 r.
The certificate of accreditation is valid from 14.12.2001 to 13.12.2005

POLSKIE CENTRUM AKREDYTACJI 1

DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI
KAROL HAUPTMANN

Warszawa, 14 grudnia 2001 roku

On December 14, 2021, it has been twenty years since the Laboratory for Research on Materials and Structures obtained the **accreditation certificate** for its research work. By obtaining accreditation, it joined the elite group of laboratories accredited by the **Polish Centre for Accreditation (PCA).** The current criteria set for accredited laboratories were formulated in the ISO/IEC 17025:2017 standard, which was included in the collection of Polish Standards by the Polish Committee for Standardization by publishing its Polish equivalent

PN-EN ISO/IEC 17025:2018-02

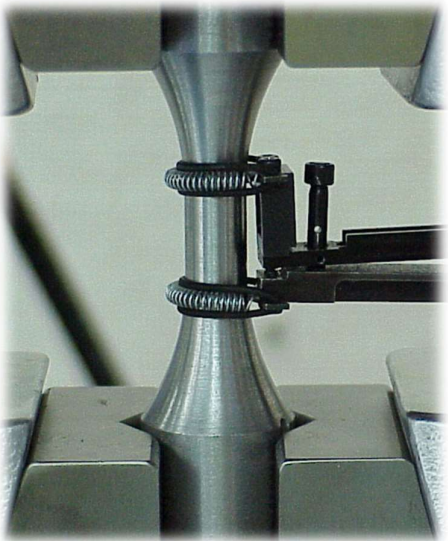
General requirements for the competence of testing and calibration laboratories." **The Polish Centre for Accreditation** is a national accrediting body authorized to accredit: certification bodies (systems, products, personnel), testing and calibration laboratories, medical laboratories, and other entities. **Accreditation** is a process in which an authorized body issues a statement that a specific entity is competent to perform specific testing activities. This requires conducting an audit of the procedures and quality of services provided by the accredited entity .

Beginning of the Laboratory

The basis for establishing the **Laboratory of Machine Design** at the Faculty of Mechanical Engineering at ATR (currently the Materials and Structures Testing Laboratory) was Ordinance No. 5/95/96 of the Rector of University of Technology and Agriculture named after J. and J. Śniadecki in Bydgoszcz on December 29, 1995.

The laboratory was established as a part of the **Department of Machine Design** under the leadership **of Prof. Dr. Hab. Eng. Józef Szala, Dr. h.c. PBS and PO**. This ordinance led to the establishment of the Department of Machine Design and the aforementioned Laboratory with the Department's rights. Dr. Eng. Stanisław Mroziński was appointed as the head of the department, a position he holds to this day.

One of the first goals to be achieved by Laboratory was to obtain the status of an **accredited laboratory** as the new unit of the Faculty



From January 1, 1996 to August 31, 2009
Laboratory of Machine Design
From 01/09/2009 to 31/12/2019
Institute Laboratory
Testing of Materials and Structures
From 01/01/2020 to today
Laboratory for Research on Materials and Structures

Equipment of the Laboratory in 2001 (room 105 in building 2.3 - currently H 003)

Equipment of the Laboratory in 2001

The basis of Laboratory equipment in 2001 were two fully computerized strength testing machines from INSTRON (INSTRON 8501 and INSTRON 8502). The Laboratory equipment was located in one laboratory room 105 on the ground floor of building 2.3 (currently D 003).

When determining the further directions of Laboratory development, it was adopted that they would be consistent with the priorities of entrepreneurship development and innovation growth by strengthening the industry environment institution in the implementation of basic, applied, developmental and implementation research. It was assumed that a modern laboratory for material and structural research should conduct research in the field of determining various properties. In the case of metal materials, these are, for example, chemical composition, mechanical strength properties. The analysis of requests for proposals addressed to the Laboratory allowed us to conclude that customers are mainly interested in comprehensive research. Conducting only partial research by the Laboratory, reduced to basic strength parameters, is a significant complication for customers and largely hinders the Laboratory staff in fully interpreting the research results. The equipment possessed by the Laboratory should enable research on both standardized samples made, for example, of composites, plastics, and machine elements made of high-strength steel, including basic, applied, and implementation research. Research on new materials with very diverse mechanical properties necessitates the concentration of modern equipment and tools with specialized applications in one laboratory.

Modern research equipment, competences, and involvement of the staff have resulted in the Laboratory, from the very beginning, performing not only the function of a university laboratory but also the function of an environmental unit providing services to companies in the region. Research work and services carried out by the Laboratory for industry have always been characterized by high quality and professionalism, which was reflected in the results of customer satisfaction assessments. This was also reflected in the awards and distinctions obtained by employees of the Department of Basic Machine Design and the Laboratory, in exhibitions with national and international scope. The wide range of services has always been addressed to both large companies modernizing their production and technological infrastructure, as well as to small and medium-sized companies lacking appropriate research facilities.

Confirmation of the high level of research work, provided services, and staff competences was obtaining **accreditation certification** for the conducted research (AB 372) by the then Laboratory of Machine Design in **2001**. It should be emphasized that in 2001, besides the Laboratory of the University of Technology in Bydgoszcz, there were only two other accredited laboratories functioning in state higher education institutions in the country.

The scope of research of the Laboratory

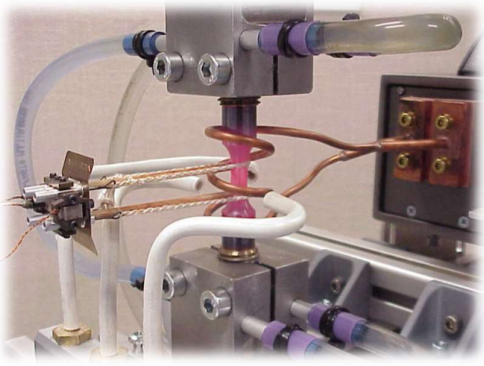
Research issues carried out by the Laboratory in the form of research services from the beginning of its activity have been related to the three basic stages of the "life" of each product, i.e. **construction, production and operation**. Each of these stages is characterized by appropriate theoretical and experimental research. Examples of some experimental studies conducted by the Laboratory are presented

in the presented publication, which is an offer for enterprises in the region.

The management of the Laboratory, consistently expanding the research scope with new methods, is aware of the role and importance of experimental research for the development of a competitive economy and its innovativeness. For this reason, it constantly monitors the needs of entrepreneurs in the region and the country. The result of the analysis of expectations was the initiation of another modernization of the Laboratory in the field of investments in 2017, which was to enable **testing of complete large-scale objects on a 1:1 scale**.

Since the date of obtaining the accreditation, the Laboratory has been enriched with further elements of equipment. Its current equipment is the result of many years of successive investment in equipment related to the purchase of new equipment (testing machines, hydraulic loading systems), as well as additional equipment for the equipment already owned (e.g. hydraulic holders with a power supply, heating chamber or induction heating system). Due to significant costs, equipment investments were carried out in stages. This allowed for the completion of very modern research equipment. Each subsequent investment is an action aimed at enriching the measuring equipment of research devices with specialized measuring devices.

Komora grzewcza do zainstalowana na maszynie wytrzymałościowej (max. 1000°C)

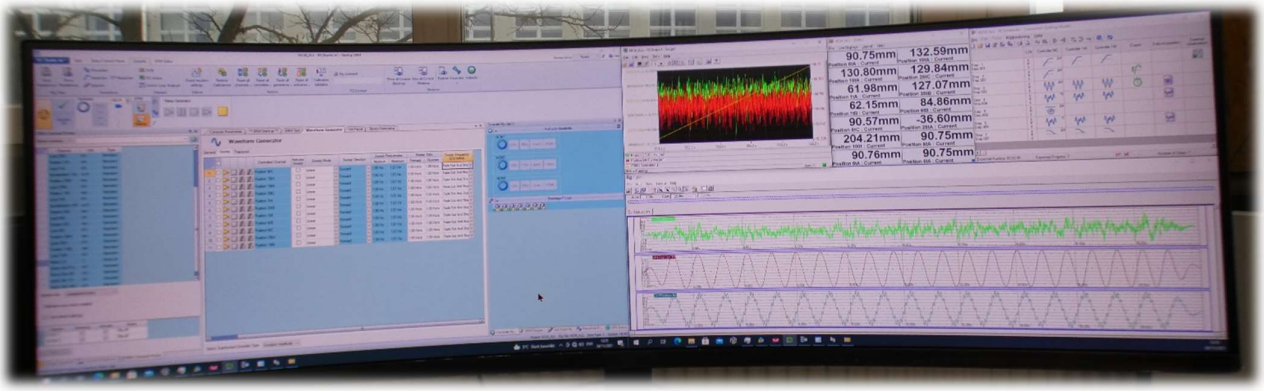


Induction heating system on the testing machine

Equipment of the Laboratory in 2021

The current laboratory equipment includes:

- four testing machines, including three hydraulic:
  - Instron 8501 (max. force: static **120** kN, dynamic **100** kN; piston stroke ±50 mm),
  - Instron 8502 (max. force: static **300** kN, dynamic **250** kN; piston stroke ±75 mm),
  - Instron 8801 (max. dynamic force **100** kN; piston stroke ±75 mm),
  - Instron 5966 (max. dynamic force **10** kN, working space 1256 mm),
- heating chamber enabling strength tests at **temperatures up to 1000°C**,
- impact hammer Zwick/Roell RKP 450 (**maximum energy 450 J**),
- FoundryMaster emission spectrometer,



- a set of feeders with a total capacity of **0.5 m^3**/min and a nominal pressure of 28 MPa, which enable the simultaneous operation of several hydraulic cylinders at a nominal load in accordance with an individual load program,
- a set of 18 hydraulic servo cylinders with hydrostatic bearings enabling long-term operation under changing loads with a nominal dynamic load **from ±10 kN to ±1000 kN**, adapted to work in any position on the frame for testing large-size structures.

The set of servo cylinder includes, among others:

- force measuring heads **from ±10 kN to ±1000 kN class 0.5** equipped with inertial sensors to compensate for inertial forces,
- backlash-free joints mounted on both sides of the servocylinder ensuring the possibility of carrying out pendulum loads without play,

- hydraulic servo cylinders in controlling the load, displacement of the piston or deformation measured with the use of an extensometer or a strain gauge in a selected area of the tested structure, enabling cooperation with any sensors used during tests and ensuring synchronous data readings in all measuring channels simultaneously .The sampling frequency of the controller is full 10 kHz for each channel, regardless of their number.

Large size structures testing system

Testing capabilities of the system for testing large-size structures:

• 4 independent research stations with an area from **1.5 m^2 to 91 m^2**,

• **18 axes** for dynamic loading **from ±10 kN to ±1000** kN,

• implementation of the load independently for each axis according to any program,

• static and dynamic loads,

• load waveform control from the level of the computer program,

• continuous registration (online) of forces, displacements and deformations,

• the ability to change the control channel during the test (3 channels to choose from),

• simultaneous deformation recording at **up to 250 measuring points**.

Testing objects:

• **not extended** dimensions of the tested structures up to **12 x 6 x 8 m** (length x width x height),

• maximum weight of the object up to **450 T**.

Gigacycle fatigue tests

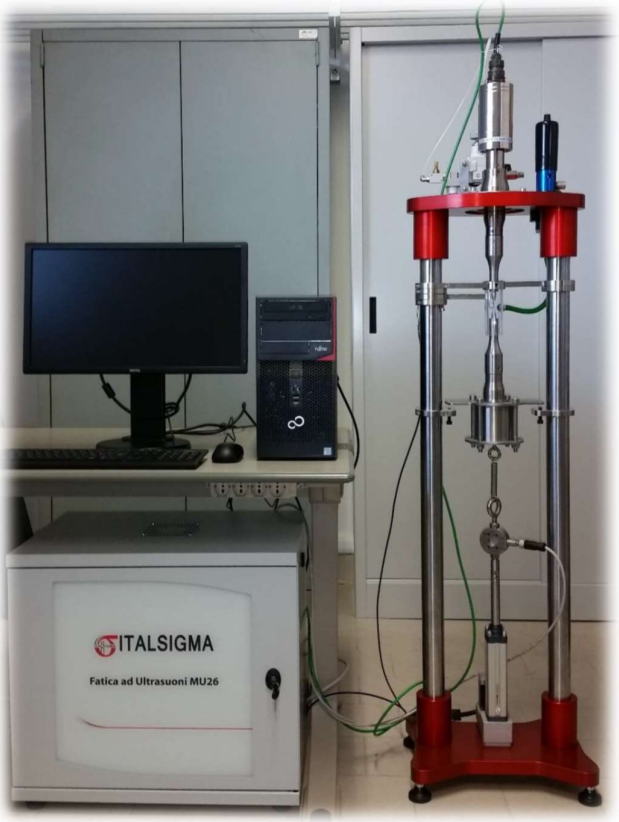
Experimental studies rarely concern fatigue life above 10^7 load cycles. An important limitation for conducting fatigue tests for such high durability is the time of testing a single sample. For 10^7 cycles it is up to 11 days

in the case of using classic hydraulic testing machines at a load frequency of 20 Hz. A fatigue test to reach 10^{10} cycles in this case would take almost 16 years. However, modern structures often achieve durability of 10^8-10^{10} load cycles. Therefore, it is necessary to determine the fatigue properties in the area exceeding the limit of 10^7 cycles, defined as the range of gigacycle fatigue. In practice, research in this area is possible thanks to the use of special ultrasonic testing machines that allow for the implementation of tests with a load frequency of 20 kHz. In this case, it takes about 8 minutes to reach 10^7 cycles, and less than 6 days to reach 10^{10} cycles.

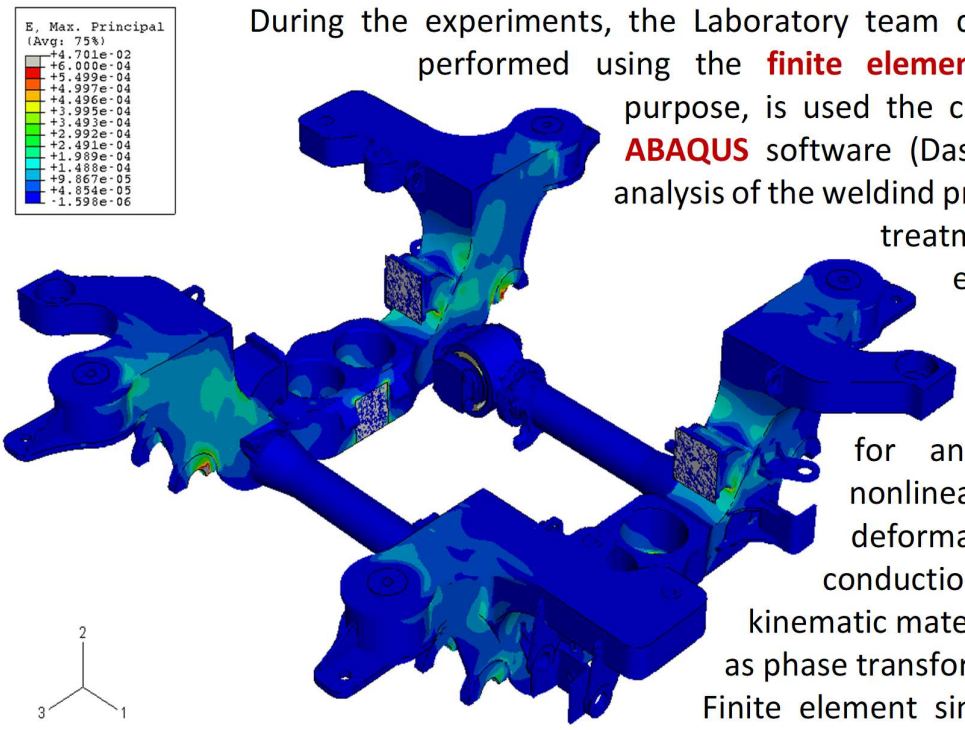
The Materials and Structures Testing Laboratory is currently the only center in Poland that has an **ultrasonic testing machine** (ItalSigma MU26), and this method of testing has been added in its scope of accreditation. This machine allows to carry out tests for oscillating loads (cycle asymmetry coefficient R = -1), as well as for R > -1. Stresses generated by the system, depending on the geometry of the sample, can reach a level of up to 1000 MPa.

All materials that show resonance at a frequency of 20 kHz and do not emit excessive heat can be tested. Belong to them:

- steel, cast steel, cast iron,
- aluminum and aluminum alloys,
- titanium and nickel alloys,
- metal matrix composites,
- metal materials made with additive technologies.

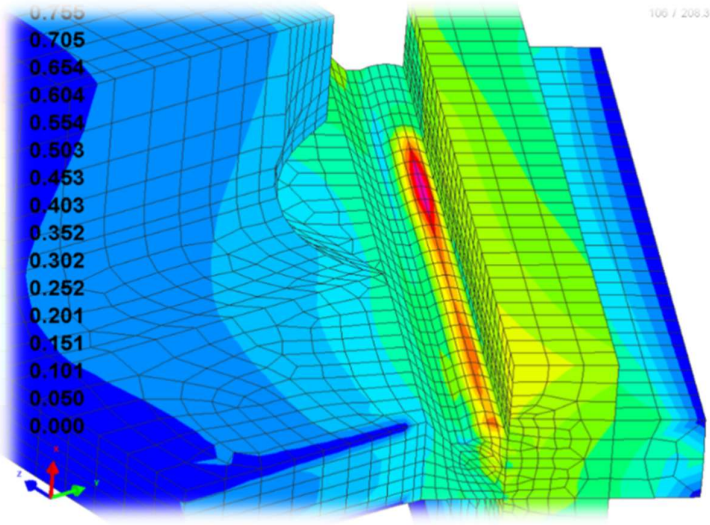


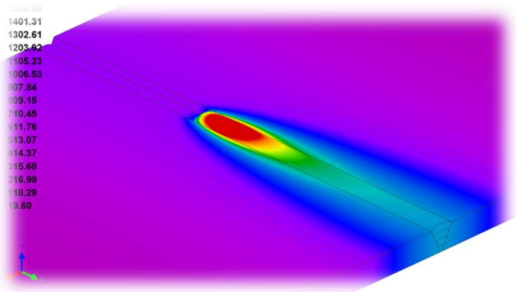
Numerical analyses FEM

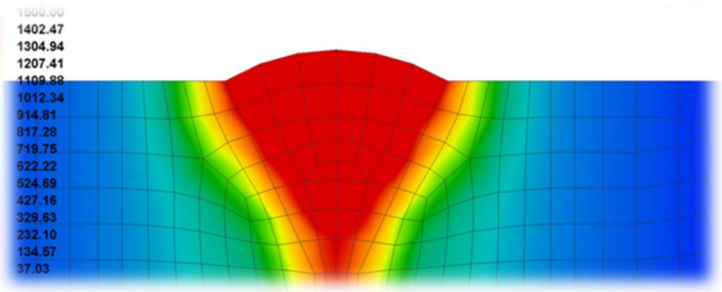


During the experiments, the Laboratory team do numerical analysis performed using the **finite element method.** For this purpose, is used the commercial version of **ABAQUS** software (Dassault Systèmes). The analysis of the weldind process, stress and heat treatment of structural elements are done by using the **SYSWELD** software package (ESI Group). It allows for analyses that include nonlinear geometry of large deformations, nonlinear heat conduction, isotropic and kinematic material hardening, as well as phase transformations.

Finite element simulations carried out using the SYSWELD package can be performed in a wide range of scenarios, including with or without filler material, for heat sources in direct physical contact with the welded element (such as spot welding, friction welding) and for heat sources not in direct contact (**such as electric arc, laser beam, electron beam**). The range of heat treatment simulations is also wide and includes tempering (**using laser, induction, electron beam, plasma, friction**), hardening, carburizing, and nitriding, among others.







Research base on infrared thermography

The research equipment allow to do the registration of basic parameters during material and construction strength tests, including forces, deformations, and displacements. In addition, an important piece of information regarding the course of the test is provided by changes in the temperature of the test object. Thermographic research is conducted in the laboratory using the CEDIP Silver 420 (FLIR SC 5200) thermographic camera equipped with a high-sensitivity InSb matrix cooled by a Stirling pump..

Main parameters of the camera are:

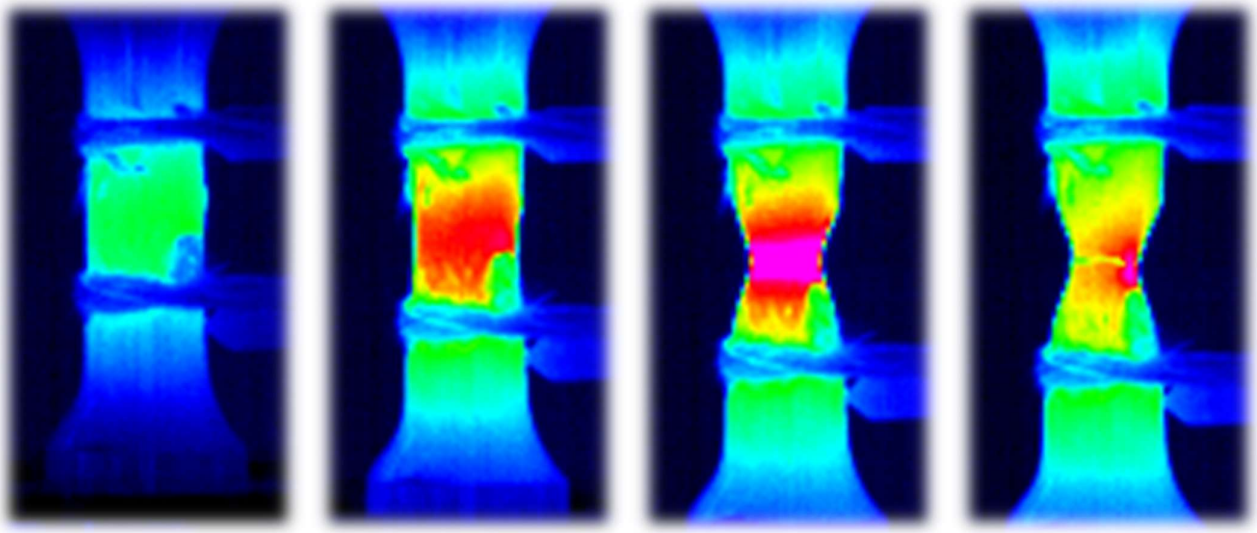
- Resolution of 320 × 256 pixels,
- Spectral range of 3.6 to 5.0 µm,
- **Sensitivity below 20 mK,**
- Maximum recording frequency for the entire matrix of 140 Hz

(higher frequencies can be achieved for lower resolutions).

Lenses:

- A primary lens with a focal length of 27 mm,
- A microscope lens with a field of view of 9.6 x 7.68 mm,
- A microscope lens with a field of view of 3.2 x 2.56 mm

The additional equipment includes a perfectly black body model MIKRON M310, allowing for calibration of the measurement system in the temperature range of +5°C to +350°C. Another additional equipment is a handheld thermal imaging camera FLIR E8. The competence of Laboratory employees is confirmed by an **international certificate** in the field of thermographic testing, **ITC Level 1**.

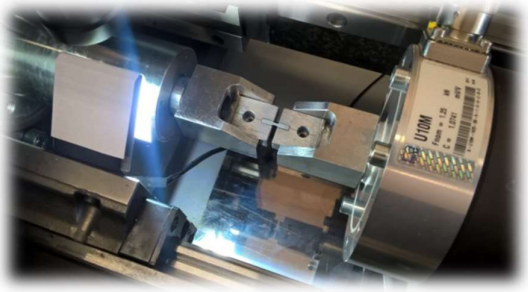


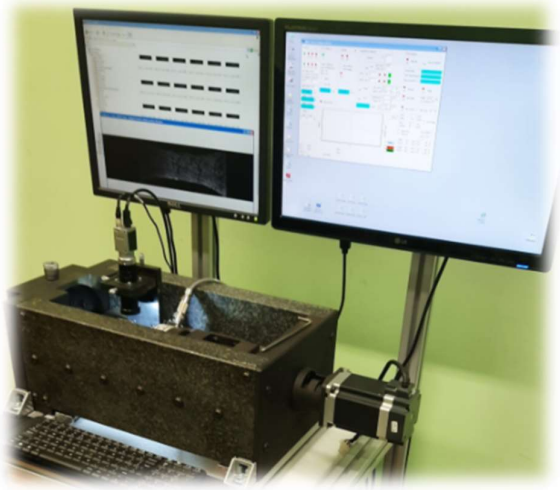
Additional testing capacity– Department of PKM and IB

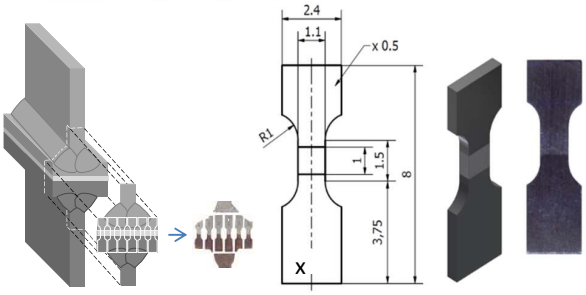
Badania Micro-object testing

MFS system for micro-object testing:

- displacement resolution: from **1.7 nm**,
- load range: from 3.5 kN to -30 kN, ±10 kN.







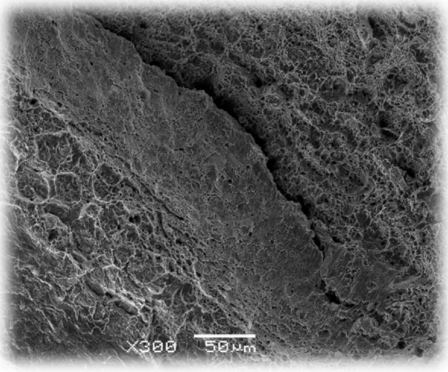
Cryogenic tests

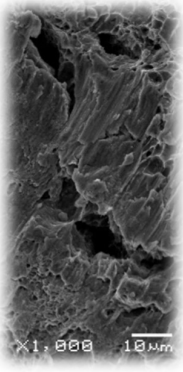
chamber with liquid nitrogen temp. **-196**°C

Electron microscopy

Electron microscope JEOL JSM 4680-LV

- low and high vacuum (**conductive and non-conductive materials**, e.g. ceramics, polymer composites),
- SE, BSE, EDS detectors,
- magnification ranging f**rom 8x to 20,000x** as standard,
- table dimensions of Ø50 mm, tilt angle of 60°, 3-axis control + rotation..





Financing source

The most important of the sources of financing under which the apparatus was acquired in the years 2000–2020:

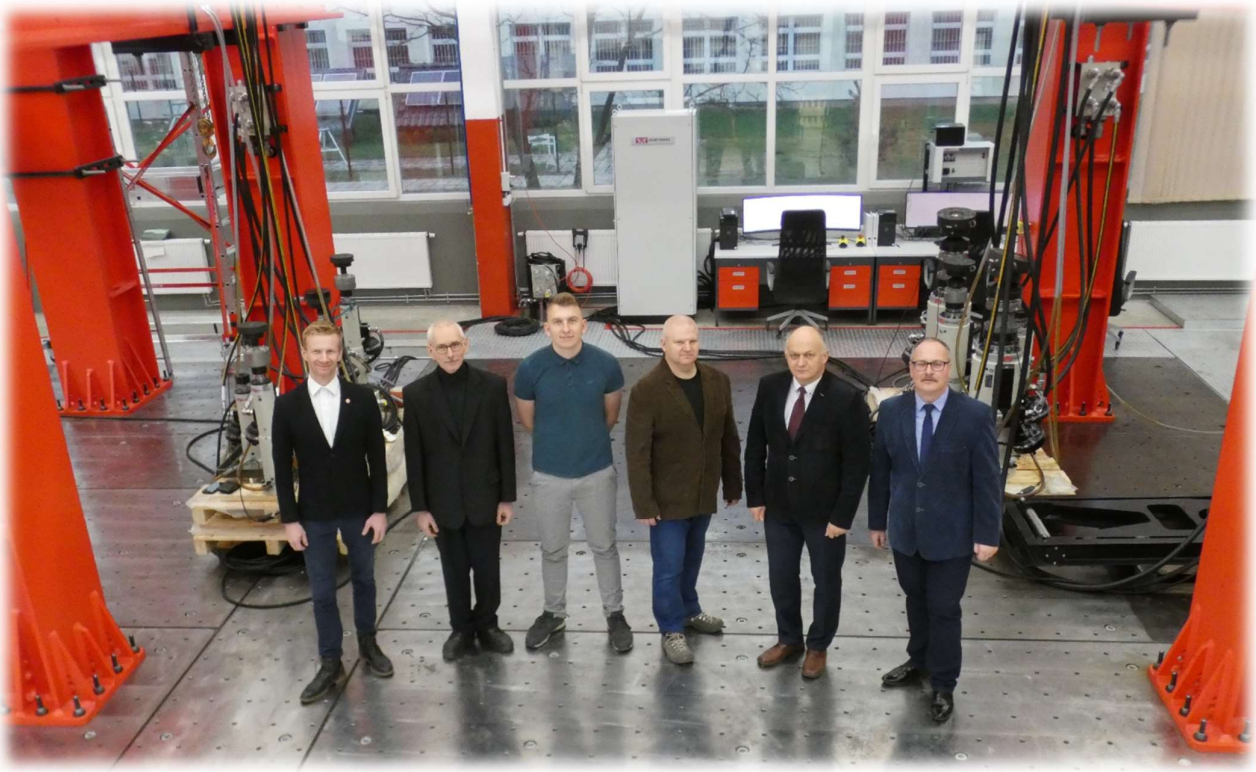
1. Project entitled "Second stage of the Regional Innovation Center"(ROP WK P). Head Dariusz Boroński PhD DSc Eng. ProfTit (project value: PLN 58 million).
2. Special research project No. EUREKA/61/2006 "Improvement of the fatigue life of riveted joints used in aircraft constructions" implemented as part of the international program EUREKA – IMPERJA E13496 - Improving the Fatigue Performance of Riveted Joints in Airframes, financed by the Ministry of Science and Higher Education in 2006–2010. Head Adam Lipski PhD DSc Eng. (project value: PLN 1,390,000).
3. Research project no. INNOTECH-K3/IN3/32/227826/NCBR/14 financed by the National Center for Research and Development in 2014-2016 under the "INNOTECH" Program - IN-TECH program path entitled "Tram bogie with a non-rigid articulated frame built under a low-floor tram". Project manager Stanisław Mroziński PhD DSc Eng. ProfTit (project value: PLN 1,360,000).
4. Project No. 2563/T07/2006/31 financed by the Ministry of Science and Higher Education in 2006–2009 entitled "Study of the process of stabilization of metal materials under variable loads". Head Stanislaw Mrozinski PhD DSc Eng. ProfTit.
5. Project No. 1215/B/T02/2011/40 funded by the National Science Center in 2011–2014 entitled "Fatigue tests of structural steel at elevated temperatures". Head Stanislaw Mrozinski PhD DSc Eng. ProfTit.
6. Own research project no. DEC-2017/25/B/ST8/02256 financed by the National Science Center in 2019-2021 entitled "Modelling of the process of low-cycle steel fatigue in non-isothermal conditions" carried out by the consortium of Cracow University of Technology and Bydgoszcz University of Technology. Head of research at PBŚ. Stanisław Mroziński PhD DSc Eng. ProfTit (total value of the project: PLN 718,970).
7. Project No. RPKP.01.01.00-04-001/17 entitled "Laboratories of technical and exact sciences dedicated to the development of research potential in the field of innovative solutions and technologies of key importance for the economy of the Kujawsko-Pomeranian" - territorial contract for the Kuyavian-Pomeranian Voivodeship Project manager Stanisław Mroziński PhD DSc Eng. ProfTit (2018–2021) (project amount PLN 44,681,942.87).
8. Own funds (copies from research conducted by the Laboratory for Industry).

Laboratory staff

The personnel of the Laboratory has been developing since obtaining accreditation in 2001 until now.

Laboratory personnel for 2023:

- Stanisław Mroziński PhD DSc Eng. ProfTit – Head of the laboratory
- Adam Lipski PhD DSc Eng. – Quality manager
- Michał Piotrowski DSc Eng. – Staff
- Zbigniew Lis MSc Eng. – Staff
- Mieczysław Mieczysławski MSc Eng. – Staff
- Piotr Swacha MSc Eng. – Staff



Michał Piotrowski, Mieczysław Mieczysławski, Piotr Swacha, Zbigniew Lis, Stanisław Mroziński, Adam Lipski

Laboratory personnel on December 14, 2001:

- Stanisław Mroziński DSc Eng. – Head of the laboratory
- Marek Szczutkowski MSc Eng. – Quality manager
- Zbigniew Lis MSc Eng. – Staff
- Andrzej Kosmatka – Staff
- Elżbieta Sadowska – Staff

Academic laboratory

The scientists mentioned include, among others, professors, assistant professors, doctors of technical sciences, and engineers who have collaborated with the laboratory in numerous research projects, as well as doctoral students and students who have completed their master's theses or engineering projects at the laboratory. The laboratory has also cooperated with many companies from the region, providing them with access to modern research equipment and expertise in various areas of engineering and technology. As a result, the laboratory has contributed significantly to the development of the local economy and the promotion of science and technology in the region. In summary, the laboratory has been and continues to be an essential part of the scientific infrastructure of the Bydgoszcz University of Technology, playing a crucial role in enabling high-quality research and promoting the development of both its personnel and the local community..:

Józef Szala PhD DSc Eng. ProfTit	
Janusz Sempruch PhD DSc Eng. ProfTit	Robert Sołtysiak DSc Eng.
Tomasz Topoliński PhD DSc Eng. ProfTit	Maciej Kotyk DSc Eng.
Dariusz Boroński PhD DSc Eng. ProfTit	Paweł Maćkowiak DSc Eng.
Dariusz Skibicki PhD DSc Eng. ProfTit	Artur Cichański DSc Eng.
Bogdan Ligaj PhD DSc Eng.	Krzysztof Nowicki DSc Eng.
Grzegorz Szala PhD DSc Eng.	Angela Andrzejewska DSc Eng.
Adam Mazurkiewicz PhD DSc Eng.	Mateusz Wyrwicki DSc Eng.
Dariusz Sykutera PhD DSc Eng.	Agata Lachiewicz-Złotowska DSc Eng.

They took advantage of the opportunity to conduct research at the Materials and Structures Testing Laboratory, which is also utilized by students of the University of Technology, participants in Doctoral Studies, and doctoral students of the Doctoral School.

The high scientific standards of research conducted at the Materials and Structures Research Laboratory and the expertise of its staff have garnered recognition not only from domestic universities but also from foreign institutions. This collaboration has involved joint research projects resulting in joint publications. Noteworthy teams include the following

- Prof. Cemal Başaran: Department of Civil, Structural and Environmental Engineering at the University at Buffalo, State University of New York, USA,
- Prof. Vincenzo Crupi: Department of Engineering, University of Messina, Italy.

Environmental Laboratory

The Laboratory's 25 years of activity as an independent organizational unit, and 20 years of operation as an accredited laboratory, have had a significant impact on the socio-economic environment of both the region and the country. Below is a list of some of the enterprises, universities, and institutes with which the Laboratory has collaborated over the past quarter-century, engaging in commissioned or joint research projects.

Companies

PESA Bydgoszcz S.A. Pojazdy Szynowe
85-082 Bydgoszcz, st Zygmunta Augusta 11
Anna Konecka PPHU ADA
88-400 Żnin, st Lewandowskiego 7
BAUMAT sp. z o.o.
85-100 Toruń, st Wapienna 10
FORM-GUM Wytw. Art. Gumowych Kaliszewski s.j.
85-877 Bydgoszcz, st Pińczowska 5
APATOR SA
87-100 Toruń, st Gdańska nr 4a lok. C4
AWE POLAND Spółka z o.o.
85-749 Bydgoszcz, st Inwalidów 3
PPHU OPAK – MET
88-100 Inowrocław, st Marcinkowskiego 110
Spółdzielnia Inwalidów im. H. Derdowskiego
89-600 Chojnice, st Morozowa 1
EL-MEDIC
87-100 Toruń, st Maszynowa 13
FORM-PLAST Spółka z o.o.
85-831 Bydgoszcz, st Toruńska 143
INTEMO S.A.
88-230 Piotrków Kujawski, st Włocławska 33
KROMISS-BIS Sp. z o.o.
42-202 Częstochowa, st Legionów 92
POLARIS Sp. z o.o.
85-833 Bydgoszcz, st Smoleńska 1b
Z.P.W. TRZUSKAWICA S.A. Zakład Kujawy
88-92 Piechcin, Bielawy 1
MPC-MCO Sp. z o.o.
85-147 Bydgoszcz, st Dąbrowa 21
PPHU OPAK-MET
88-100 Inowrocław, st Poznańska 40–42
Z.P. „BOHAMET" s.j. H. Bogusz, J. Halarewicz
86-005 Białe Błota, Ciele 91
ESGE Polska Edelstahl und Rohr Sp. z o.o.
87-322 Jastrzębie, Jastrzębie 61
Poland Tokai Okaya Manufacturing Sp. z o.o.
87-148 Łysomice, Ostaszewo 57G
APV Manufacturing Poland Sp. z o.o.
85-451 Bydgoszcz, st Grunwaldzka 229
Stocznia Gdańska S.A.
80-873 Gdańsk, st Na Ostrowiu 15/20
P.H.-U. PLASTECH Zofia i Lech Joachimiak
86-031 Osielsko, Niemcz, st T. Kościuszki 8
Zakł. Laminatów Poliestrowych „Trokotex" Sp. z o.o.
87-100 Toruń, st Polna 103/105
TYCO Electronics Polska Sp. z o.o.
85-059 Bydgoszcz, st Unii Lubelskiej 4
DIUNA Sp.J. Piotr Drabiński, Jerzy Wyporkiewicz
85-738 Bydgoszcz, st Szajnochy 3
ETHERM Spółka z o.o.
86-031 Osielsko, st Jana Pawła II 16
KROSS, Sp. z o.o.
06-300 Przasnysz, st Leszno 46
BREMBO
42-200 Częstochowa, st J.H. Dąbrowskiego 69
AIRON INVESTMENT S.A.
85-862 Bydgoszcz, st Raczkowskiego 8
APX Technologie Sp. z o.o.
05-816 Opacz, st Centralna 27
Zakłady Azotowe w Tarnowie-Mościcach S.A.
33-101 Tarnów, st Kwiatkowskiego 8
Bydgoskie Zakłady Elektromechaniczne BELMA S.A.
86-005 Białe Błota, st Łochowska 69
BIN-MONTAŻ Sp. z o.o.
85-861 Bydgoszcz, st Glinki 144
KURP DACH Sp. z o.o.
07-405 Troszyn, Kurpie Dworskie 29
BMZ Polska Sp. z o.o.
40-085 Katowice, st Mickiewicza 29
QDS24 Sp. z o.o.
85-758 Bydgoszcz, st Przemysłowa 8
BUSTER G. Buczyński, P. Buczyński,
L. Stejter, P. Stejter s.j.
88-101 Inowrocław, st Wiejska 81
CMC Zawiercie S.A., Biuro Zarządzania Jakością
42-400 Zawiercie, st Piłsudskiego 82

P.P.-U. ECOSTEEL Sp. z o.o.
42-400 Zawiercie, st Okólna 10
EL-MEDIC
87-100 Toruń, st Maszynowa 13
P.P.U.H. ERPLAST Krzysztof Rymer Z.P.Chr.
85-778 Bydgoszcz, st Witebska 27
FADO Sp. z o.o.
85-862 Bydgoszcz, st Solna 7a
GEA Farm Technologies Sp. z o.o.
85-461 Bydgoszcz, st Ołowiana 10
GGS-Technologies Sp. z o.o.
85-871 Bydgoszcz, st Smoleńska 37
INOFAMA S.A.
88-100 Inowrocław, st Metalowców 7
P.P.-U. METALBARK
86-060 Nowa Wieś Wielka, st Jagodowa 11
TELE-FONIKA Kable Sp. z o.o. S.K.A.
85-957 Bydgoszcz, st Fordońska 152
KLIMAT SOLEC Sp. z o.o.
86-050 Solec Kujawski, st Nadborna 2a
NUCAIR Technologies Sp. z o.o.
86-050 Solec Kujawski, st Powstańców 8B
SEAT MED Sp. z o.o.
86-050 Solec Kujawski, st Unii Europejskiej 4
DOBPLAST
86-031 Osielsko, st Szosa Gdańska 48
STOLMAR Sp. z o.o.
86-005 Białe Błota, Kruszyn Krajeński, st Usługowa 2
METALKO Sp. z o.o.
85-825 Bydgoszcz, st Wojska Polskiego 65
GCB METAL-PPRODUKT Sp. z o.o.
85-461 Bydgoszcz, st Srebrna 12
P.P.-H. POL-ELEKTRA
86-065 Łochowo, Łochowice, st Nakielska 7
NOMET Sp. z o.o.
87-100 Toruń, st Kanałowa 40/42
NOVA-TECH Sp. z o.o.
86-100 Świecie, Sulnowo 53B
Zakłady Badań i Atestacji ZETOM
40-384 Katowice, st Bednorza 17
Ośr. Badań i Certyfikacji SIMPTEST ZOKJW Sp. z o.o.
40-045 Katowice, st Astrów 10
BSW Badiche Stahlwerke GmbH
Grandeuzer Straße 45
BORYSZEW Tensho Poland Sp. z o.o.
87-148 Łysomice, Ostaszewo 57F
Vossloh Cogifer Polska sp. z o.o.
85-502 Bydgoszcz, Ludwikowo 2
MTB Trzebińscy Sp.j.
89-100 Nakło n/Notecią, st Dolna 1A
Wytwórnia Pianek Poliuretanowych Sp. z o.o.
85-825 Bydgoszcz, st Wojska Polskiego 65
Bydgoskie Zakł. Przemysłu Gumowego STOMIL S.A.
85-950 Bydgoszcz, st Toruńska 155
KMW Engineering Group Sp. z o.o.
86-050 Solec Kujawski, st Powstańców 8a
CHAMPION
86-300 Grudziądz, st Waryńskiego 32–36
Hydrochem sp. z o.o.
85-826 Bydgoszcz, st Hubala Dobrzańskiego 10
IMPEXPART Adam Poćwiardowski
86-031 Osielsko, st Niedźwiedzia 20

And many more

UCZELNIE PAŃSTWOWE

Politechnika Gdańska, Wydział Mechaniczny
80-952 Gdańsk, st G. Narutowicza 11/12
Politechnika Łódzka, Instytut Inżynierii Materiałowej
90-924 Łódź, Dr Engefanowskiego 1/15
Politechnika Krakowska im. Tadeusza Kościuszki
31-155 Kraków, st Warszawska 24
Politechnika Wrocławska
50-370 Wrocław, Wybrzeże St. Wyspiańskiego 27
Wojskowa Akademia Techniczna im. J. Dąbrowskiego
00-908 Warszawa, st Gen. Sylwestra Kaliskiego 2
Politechnika Częstochowska
42-200 Częstochowa, st J.H. Dąbrowskiego 69
Politechnika Opolska, Wydział Mechaniczny
45-758 Opole, st Prószkowska 76
Uniwersytet Kazimierza Wielkiego
85-064 Bydgoszcz, Chodkiewicza 30

INSTYTUTY BADAWCZE

Instytut Lotnictwa
02-256 Warszawa, Al. Krakowska 110/114
Instytut Spawalnictwa
44-100 Gliwice, st Błogosławionego Czecha 16/18

What next?

On October 11, 2021, another, twentieth evaluation of the Laboratory under supervision was carried out by auditors of the Polish Center for Accreditation. Based on the results of this assessment, the Laboratory for Research on Materials and Structures obtained an extension of its accreditation for another four years (2021-2025). We are very proud that once again we have confirmed our competence. We invite all interested parties to familiarize themselves with our research offer. We are ready to help you in conducting research covered by our scope of accreditation, as well as solve research problems that are not covered by it.

POLSKIE CENTRUM AKREDYTACJI
POLISH CENTRE FOR ACCREDITATION

PCA POLSKIE CENTRUM AKREDYTACJI

Sygnatariusz EA MLA
EA MLA Signatory

CERTYFIKAT AKREDYTACJI
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY
Nr AB 372

Potwierdza się, że: / This is to confirm that:

POLITECHNIKA BYDGOSKA
im. JANA I JĘDRZEJA ŚNIADECKICH
LABORATORIUM BADAŃ MATERIAŁÓW I KONSTRUKCJI
Al. prof. S. Kaliskiego 7, 85-796 Bydgoszcz

spełnia wymagania normy PN-EN ISO/IEC 17025:2018-02
meets requirements of the PN-EN ISO/IEC 17025:2018-02 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AB 372
Accredited activity is defined in the Scope of Accreditation No AB 372

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w Kontrakcie Nr AB 372
This accreditation remains in force provided the Laboratory observes the requirements of Accreditation Body defined in the Contract No AB 372

Akredytacji udzielono dnia 14.12.2001 r.
Accreditation was granted on 14.12.2001

031645

POLSKIE CENTRUM AKREDYTACJI 1

DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI
LUCYNA OLBORSKA

Warszawa, dnia 16 listopada 2021 roku

Certyfikat akredytacji na lata 2021–2025

ZAKRES AKREDYTACJI
LABORATORIUM BADAWCZEGO
SCOPE OF ACCREDITATION FOR TESTING LABORATORY
Nr/No AB 372

wydany przez / issued by
POLSKIE CENTRUM AKREDYTACJI
01-382 Warszawa, ul. Szczotkarska 42

Wydanie/Issue 18 z/of 16.11.2021

	Nazwa i adres / Name and address
PCA Polskie Centrum Akredytacji BADANIA AB 372	**POLITECHNIKA BYDGOSKA** **im. JANA I JĘDRZEJA ŚNIADECKICH** **LABORATORIUM BADAŃ MATERIAŁÓW I KONSTRUKCJI** **Al. prof. S. Kaliskiego 7** **85-796 Bydgoszcz**

Kod identyfikacyjny / Identification code *)	Dziedzina i przedmiot badań / Field of testing and item:
- J/8; J/13	- Badania mechaniczne wyrobów i materiałów konstrukcyjnych oraz maszyn / Mechanical tests of construction products and materials, machines

Wersja strony/Page version: A

*) Kod identyfikacyjny zgodnie z załącznikiem do dokumentu DAB-07 dostępnym na stronie internetowej www.pca.gov.pl / The identification code according to the Annex to document DAB-07, available at PCA website www.pca.gov.pl

POLSKIE CENTRUM AKREDYTACJI * 1 *

p.o. KIEROWNIKA DZIAŁU AKREDYTACJI
BADAŃ MECHANICZNYCH I FIZYCZNYCH
MARIA SZAFRAN

Niniejszy dokument jest załącznikiem do Certyfikatu Akredytacji Nr AB 372 z dnia 16.11.2021 r.
Cykl akredytacji od 16.11.2021 r. do 13.12.2025 r.
Status akredytacji oraz aktualność zakresu akredytacji można potwierdzić na stronie internetowej PCA www.pca.gov.pl

This document is an annex to accreditation certificate No. AB 372 of 16.11.2021 r.
Accreditation cycle from 16.11.2021 to 13.12.2025
The status of accreditation and validity of the scope of accreditation can be confirmed at PCA website *www.pca.gov.pl*

The scope of accreditation of the Materials and Structures Testing Laboratory, November 16, 2021.

Laboratorium Badań Materiałów i Konstrukcji Al. prof. S. Kaliskiego 7; 85-796 Bydgoszcz		
Przedmiot badań/wyrób	**Rodzaj działalności/badane cechy/metoda**	**Dokumenty odniesienia**
Metale i stopy metali	Własności mechaniczne: - wytrzymałość na rozciąganie R_m, - umowna granica plastyczności R_p, - wyraźna granica plastyczności R_e, - wydłużenie A, - przewężenie Z Zakres: siła F do 250 kN Próba rozciągania w temperaturze pokojowej.	PN-EN ISO 6892-1:2020-05 Metoda B ASTM E8 / E8M-21
	Własności mechaniczne: - wytrzymałość na rozciąganie R_m, - umowna granica plastyczności R_p, - wyraźna granica plastyczności R_e, - wydłużenie A, - przewężenie Z Zakres: siła F do 250 kN Próba rozciągania w temperaturze podwyższonej do 350°C	PN-EN ISO 6892-2:2018-08 ASTM E21-20
	Charakterystyczne własności zmęczeniowe w warunkach osiowego rozciągania i ściskania. Zakres: maks. obciążenie ±250 kN Charakterystyczne własności zmęczeniowe w warunkach zginania Zakres: maks. moment ±50 Nm Próba zmęczeniowa w temperaturze do 350°C	PN-76/H-04326 PN-74/H-04327 ASTM E466-21
	Własności zmęczeniowe w warunkach niskocyklowego zmęczenia metali Zakres: maks. obciążenie ±250 kN Próba zmęczeniowa w temperaturze do 350°C	PN-84/H-04334 ASTM E606 / E606M-21
	Własności zmęczeniowe w warunkach wysoko- i gigacyklowego zmęczenia metali: Zakres: częstotliwość obciążenia 20 ± 0,5 kHz Współczynnik asymetrii cyklu $R \geq -1$ Próba zmęczeniowa w temperaturze do 350°C	Procedura PB-02 wydanie 2 z dnia 01.09.2021 r.
Stal do zbrojenia i sprężania betonu	Próba rozciągania Zakres: siła F do 250 kN	PN-EN ISO 15630-1:2019-04 PN-EN ISO 15630-2:2019-04
	Próba zmęczeniowa Zakres: maks. obciążenie ±250 kN	PN-EN ISO 15630-1:2019-04 PN-EN ISO 15630-2:2019-04
Zespoły maszynowe i elementy konstrukcyjne mechaniczne lub fragmenty konstrukcji	Wytrzymałość w warunkach statycznego obciążenia Zakres: maks. obciążenie 250 kN Próby rozciągania lub ściskania Wytrzymałość w warunkach obciążenia zmiennego Zakres: maks. obciążenie ±250 kN Próby zmęczeniowe	Procedura PB-01 wydanie 2 z dnia 01.09.2021 r.

Wersja strony: A

Przedmiot badań/wyrób	Rodzaj działalności/badane cechy/metoda	Dokumenty odniesienia
Ramy wózków pojazdów szynowych	Badania statyczne Zakres: maks. obciążenie 250 kN Zakres: maks. przemieszczenie ±125 mm Badania zmęczeniowe Zakres: maks. obciążenie ±250 kN Zakres: maks. przemieszczenie ±125 mm	PN-EN 13749:2011 p. 6.2.3, 6.2.4

Wersja strony: A

Wykaz zmian
Zakresu Akredytacji Nr AB 372

Status zmian: wersja pierwotna – A

POLSKIE CENTRUM AKREDYTACJI * 1 *

Zatwierdzam status zmian

p.o. KIEROWNIKA DZIAŁU AKREDYTACJI BADAŃ MECHANICZNYCH I FIZYCZNYCH

MARIA SZAFRAN
dnia: 16.11.2021 r.

031643

Many thanks

I would like to thank all those who supported the activities of the Laboratory at the Faculty of Mechanical Engineering of the Bydgoszcz University of Technology in all periods of its activity. These include Rectors and Deans who managed the University and the Faculty in the years 2001–2021. They were in order of function:

Rectors	**Deans**
Janusz Sempruch PhD DSc Eng. ProfTit	Jan Szafrański DSc Eng.
Zbigniew Skinder PhD DSc Eng. ProfTit	Henryk Holka PhD DSc Eng.
Antoni Bukaluk PhD DSc Eng. ProfTit	Bogdan Żółtowski PhD DSc Eng. ProfTit
Tomasz Topoliński PhD DSc Eng. ProfTit	Janusz Sempruch PhD DSc Eng. ProfTit
Marek Adamski PhD DSc Eng. ProfTit	Janusz Musiał PhD DSc Eng.
	Piotr Aleksandrowicz PhD DSc Eng.

I would like to express my sincere gratitude to the management of PESA Bydgoszcz S.A. for their participation in a joint project funded by the National Center for Research and Development "INNOTECH". This collaboration resulted in the creation of a test stand for fatigue testing of large-sized objects in 2016.

I am also immensely grateful to all my collaborators who have contributed to the success of the Laboratory. Their help, dedication, commitment, reliability, and conscientiousness have been crucial to our success as an accredited entity for the past 20 years. I extend my thanks to all my colleagues who have worked in the Laboratory, even if they were not mentioned by name. Each of them has played a role in shaping our current image.

Finally, I would like to give special thanks to **Professor Józef Szala**, who entrusted me with the management of the Laboratory in his Department back in 1995. It was a significant challenge for me, but with Mr. Professor's constant care and attention to research facilities, as well as his emphasis on the importance of experimental research in the design and construction process, we have achieved great success. As a result, in 2022, the Bydgoszcz University of Technology can proudly boast a Laboratory with the highest research competence in the field of fatigue testing of materials and structural elements.

Head of the Laboratory
for Research on Materials and Structures

Stanisław Mroziński PhD DSc Eng. ProfTit

Research before the creation of an independent laboratory

It is worth emphasizing that before the independent Laboratory was separated from the Department of Fundamentals of Machine Design, the Faculty of Mechanical Engineering conducted extensive research on the fatigue of materials and structures from its inception. Although the Department did not have testing machines, it carried out research to meet the needs of companies in the region, building its own unique test stands. **The experience gained during this period is now successfully utilized in implementing unconventional orders from the Laboratory's customers.**

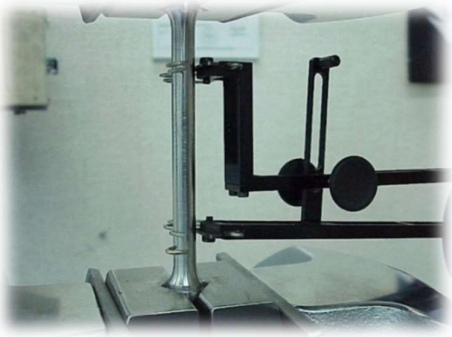
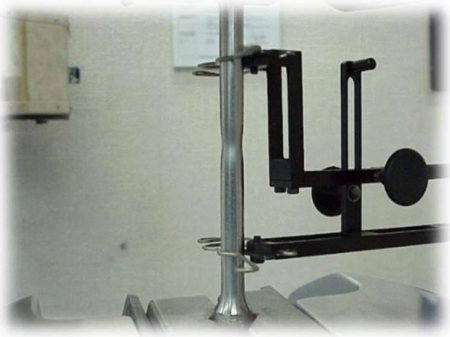
During that time, the Department cooperated with the largest enterprises, including Zakłady Rowerowe "Predom-Romet" from Bydgoszcz and Bydgoszcz Cable Factory. The employees of the Department and the Laboratory specialize in fatigue tests, which were conducted using special research equipment designed and manufactured at the University. This equipment was utilized during the fatigue tests of single-track vehicle components manufactured by Zakłady Rowerowe and products of Bydgoska Fabryka Kabli. The test stands, their assemblies, and the solutions used in them were reserved in the form of utility models and patents. At these test stands, bicycle and moped frames, bicycle forks, and power cables were subjected to fatigue tests..

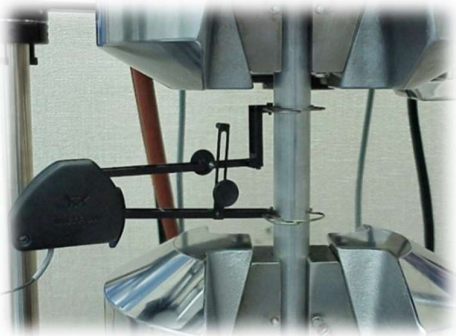
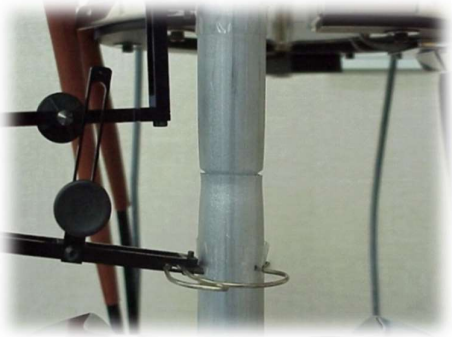
Unique test stands designed for testing two-wheeled vehicle components ZR „Predom-Romet”

Tests in the laboratory after 2001.

The following pages contain an overview of selected objects (samples, construction nodes, finished products, large-size objects), which illustrates the scope and variety of research carried out in the Laboratory.

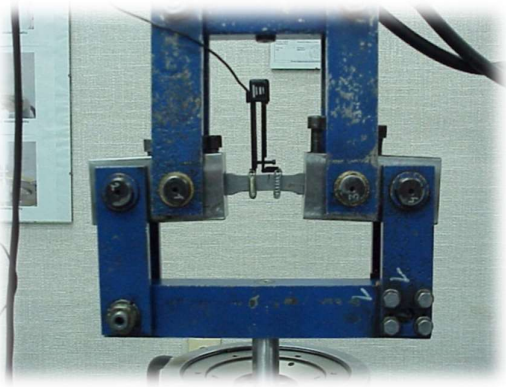
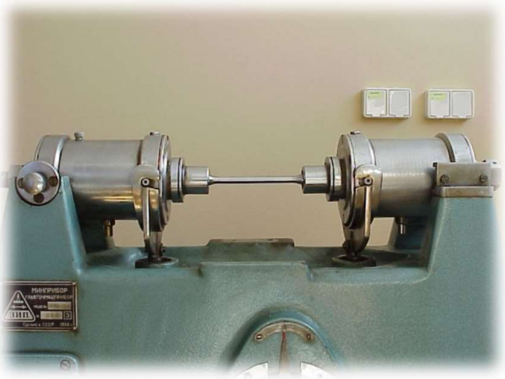
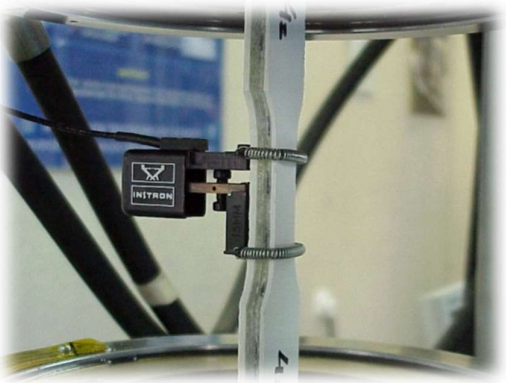
Testing of construction materials (metals and their alloys)

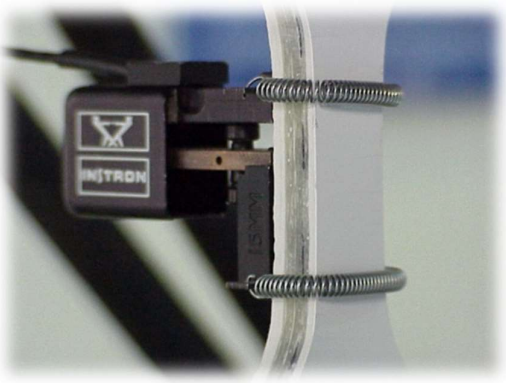



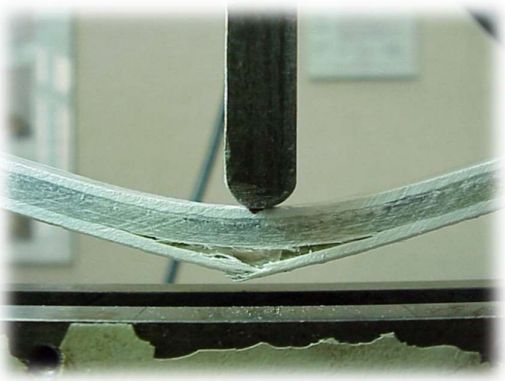




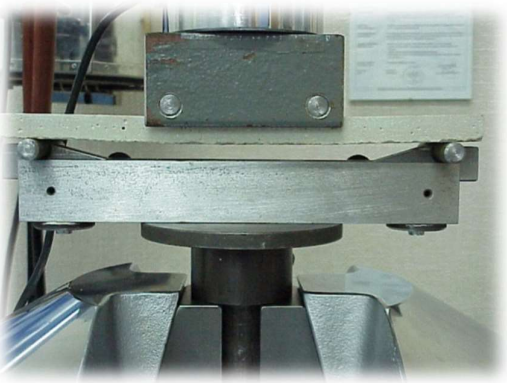
Tests in the laboratory after 2001.

Testing of construction materials (metals and their alloys, composite materials, rubber)

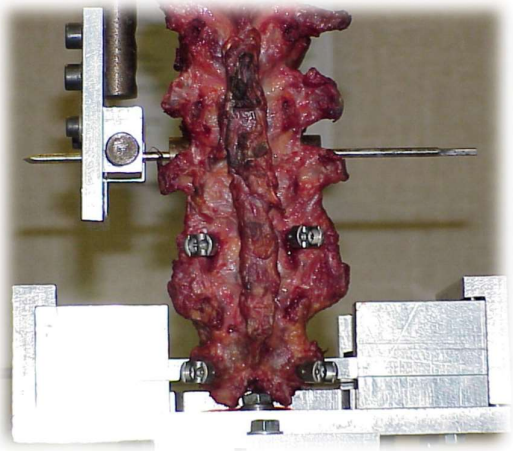


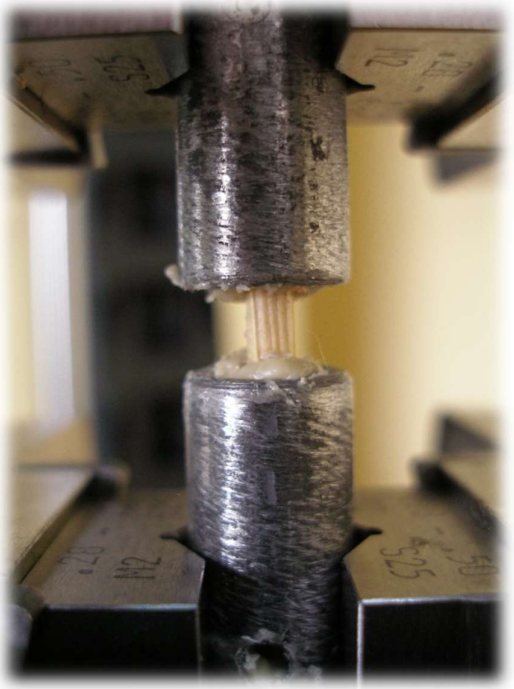





Tests in the laboratory after 2001.

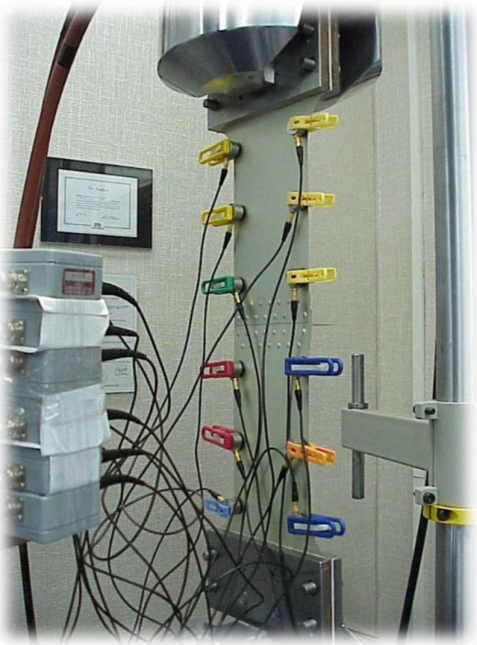
Research in the field of bioengineering



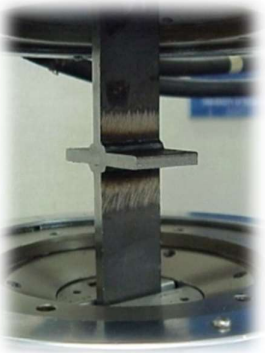


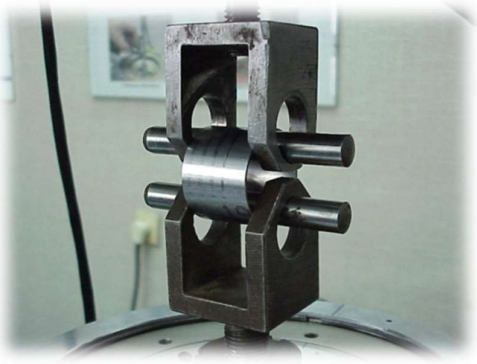
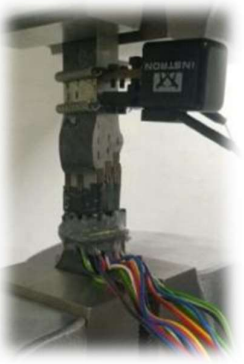
Tests in the laboratory after 2001.

Testing of joints used in machine construction



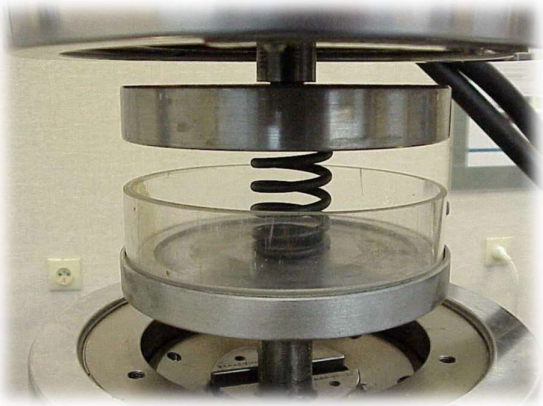


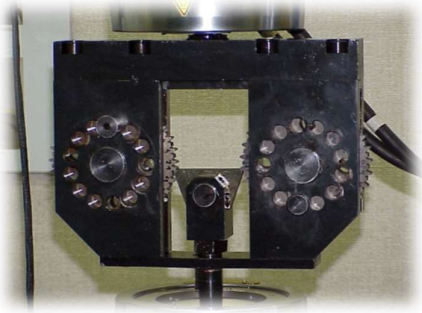



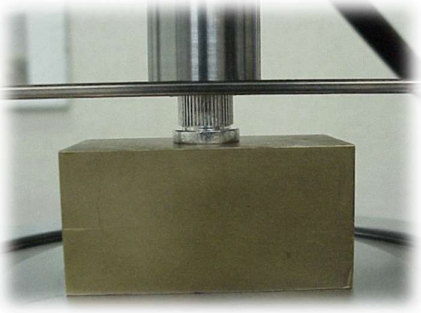




Tests in the laboratory after 2001.

Testing of finished products

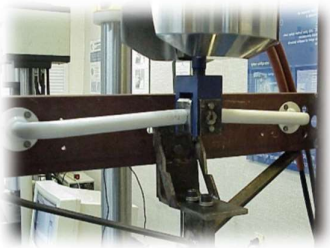
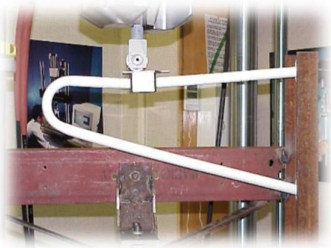
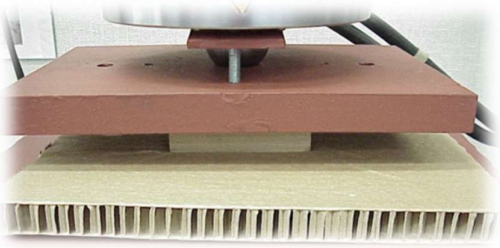



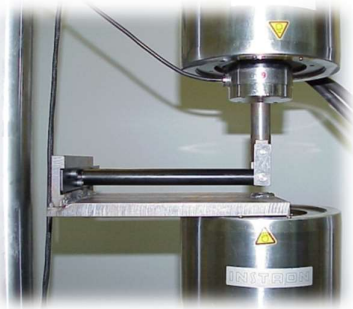
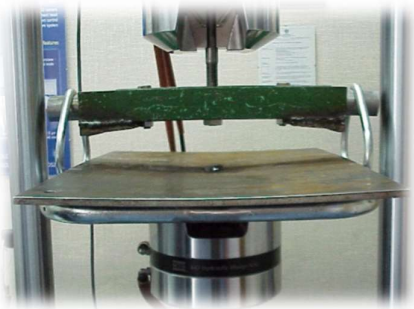
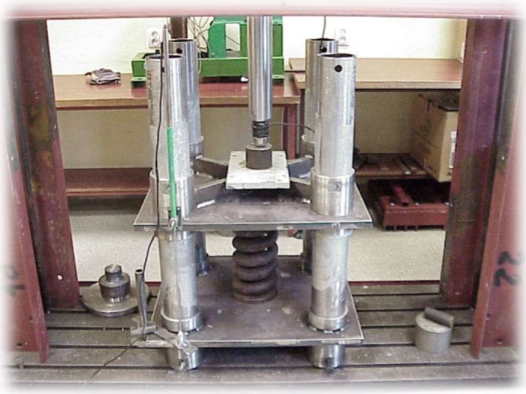




Tests in the laboratory after 2001.

Testing of finished products

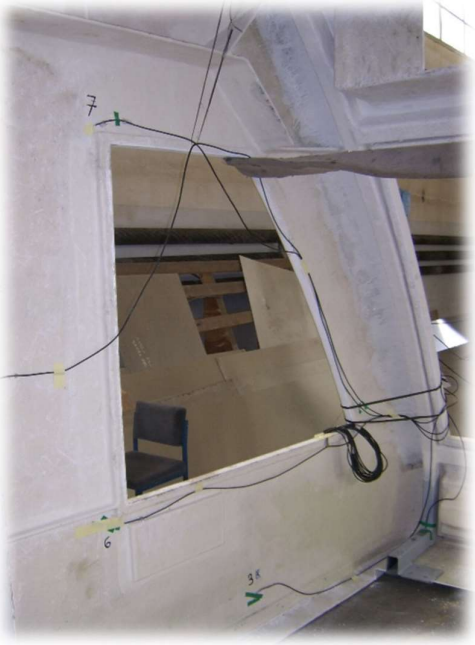




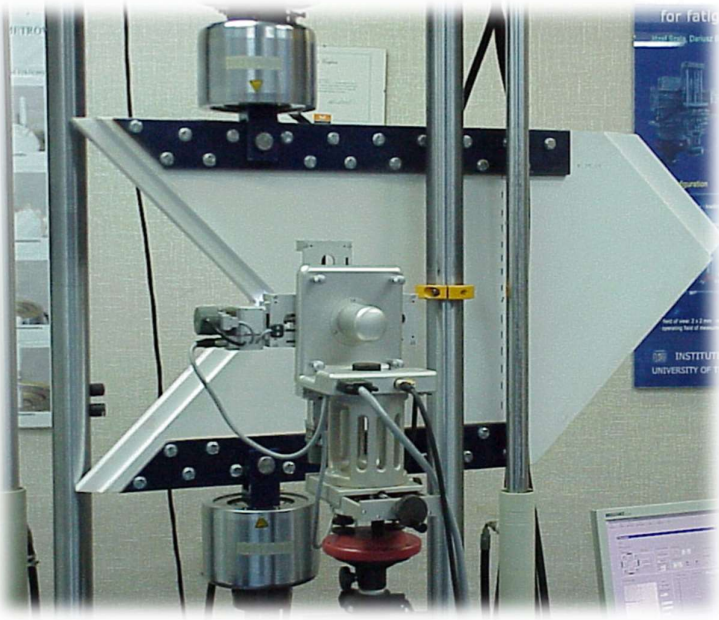







Tests in the laboratory after 2001

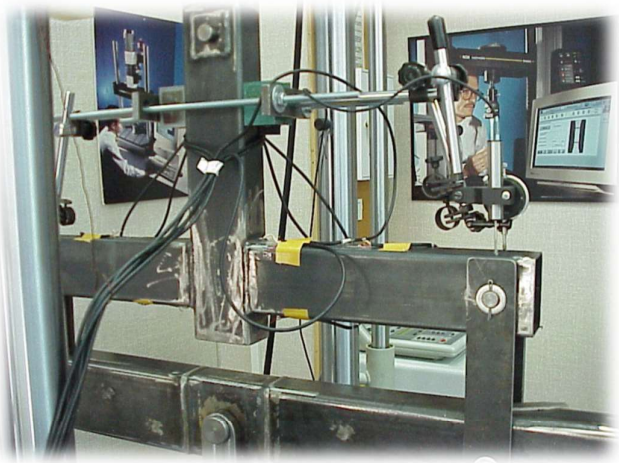
Testing of complex objects

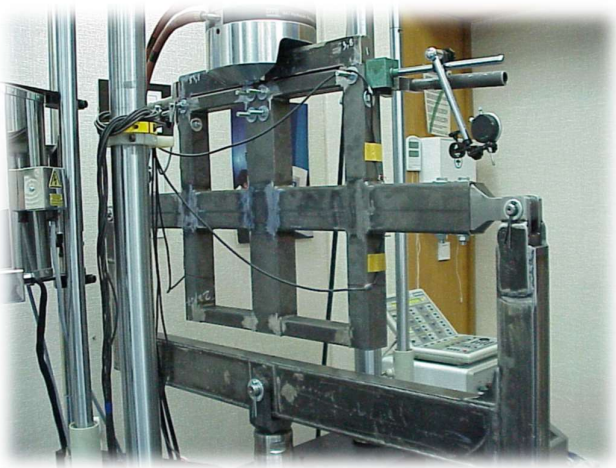


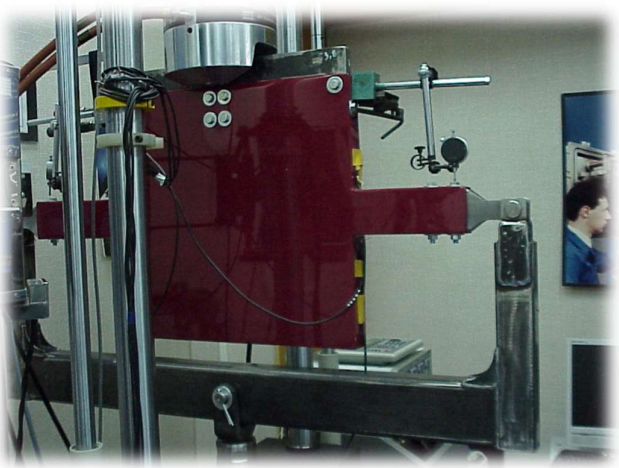


Tests in the laboratory after 2001

Testing of complex objects

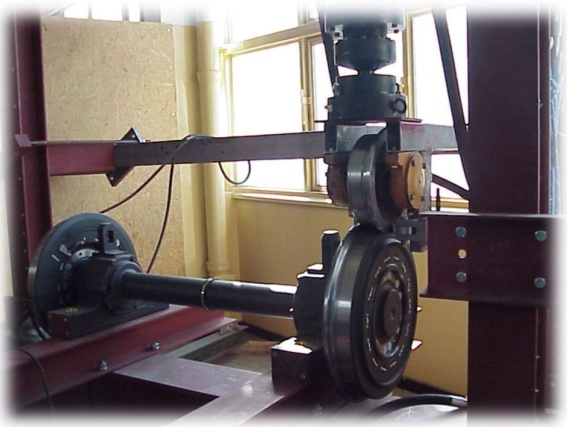


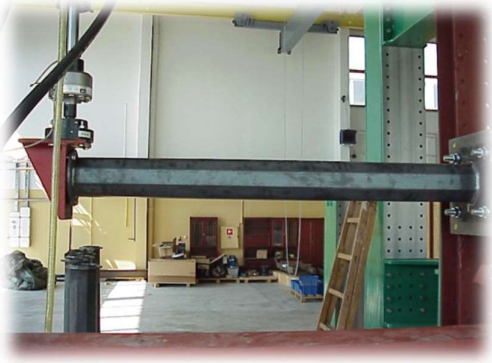




Tests in the laboratory after 2001

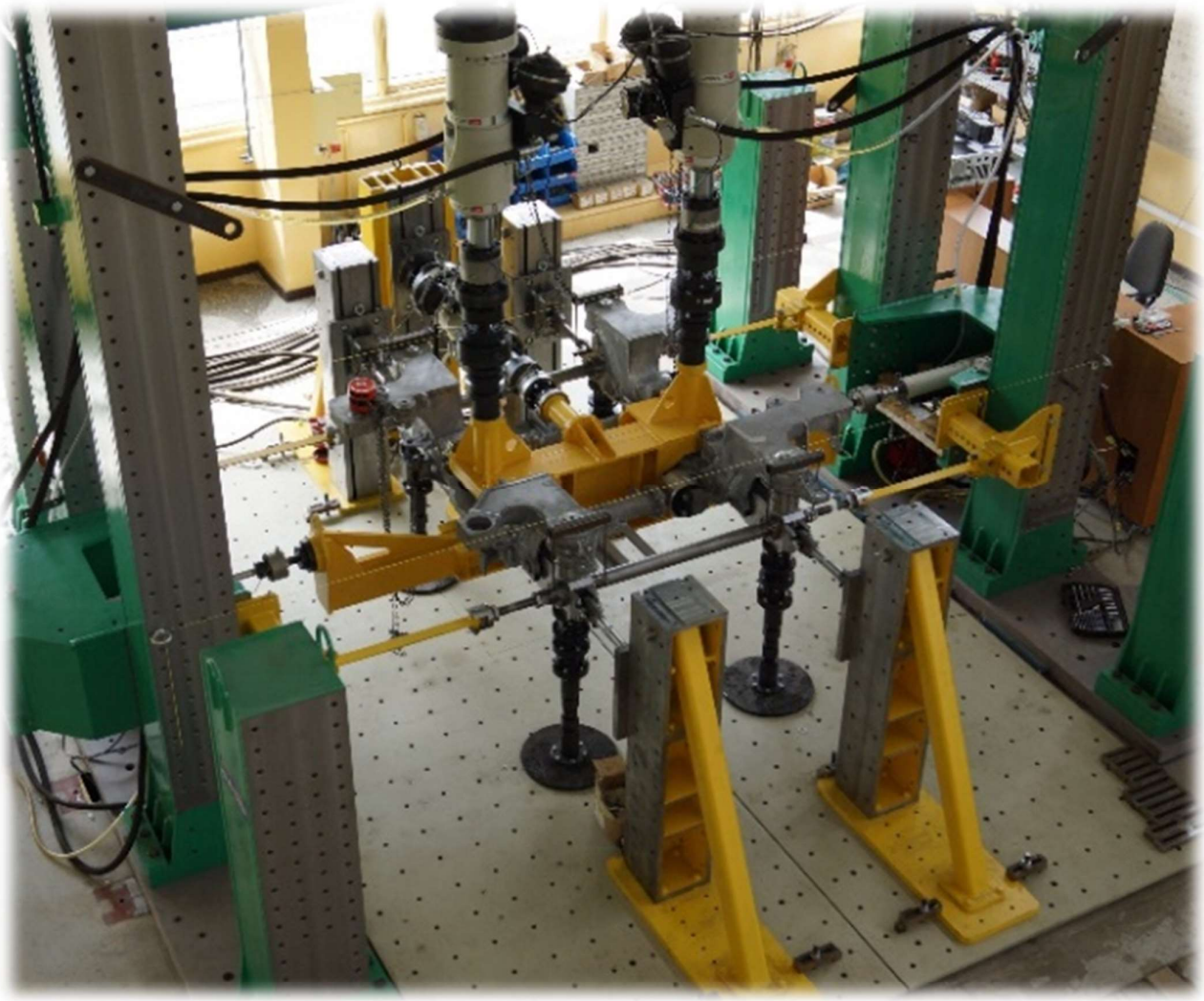
Testing of complex objects

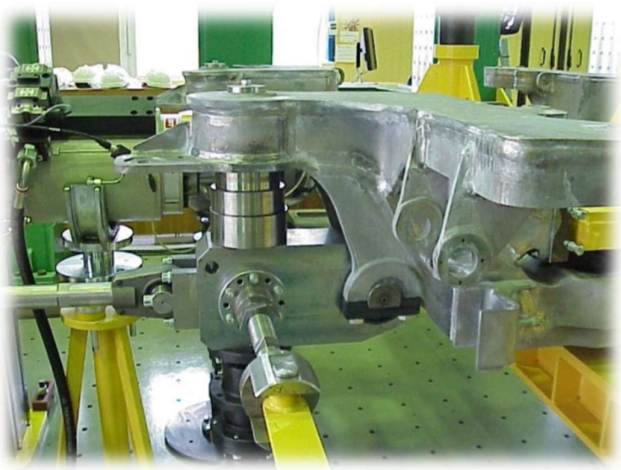


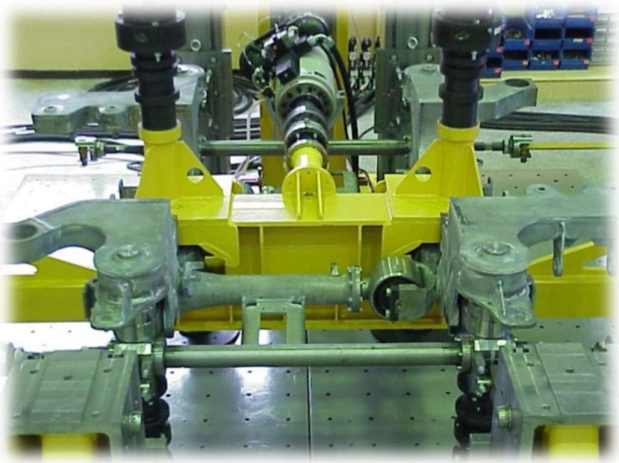


Tests in the laboratory after 2001

Testing of complex objects







Timeline

1951 • Establishment of the Evening School of Engineering with two faculties: Mechanical and Chemical.
1952 • Creation of the Main Library of the WSI.
1953 • Taking over the first building of the WSI at Olszewskiego St. (now Rev. A. Kordecki St.) 20.
1954 • Temporary suspension of the activity of the Faculty of Chemistry.
1960 • Commissioning of a workshop hall at 20 Olszewskiego St.
1961 • Establishment of the Department of Telecommunications.
1963 • Commissioning of building B at 20 Olszewskiego St.
1964 • Transformation of the University into the Higher School of Engineering.
• Creation of the Faculty of General Engineering with majors in mechanical and electrical engineering.
• Establishment of the School of Physical Education and the Military School.
1965 • Establishment of the Department of Foreign Languages.
• Transformation of the Faculty of Telecommunications into the Faculty of Electrical Eng. and Telecommunications.
1966 • Reactivation of the Faculty of Chemical Technology.
1967 • Creation of the Faculty of Civil Engineering.
• Takeover by the WSI of the buildings at 3 Seminariona St. and 18–20 Grodzka Street.
1968 • The WSI is named after Jan and Jędrzej Śniadecki. Opening of the Main Library's Book and Magazine Reading Room.
1969 • Opening of the WSI Computing Center.
• Transfer of the buildings at Bernardyńska 6 and H. Sawicka (now Mazowiecka) 28 to the disposal of the branch.
1973 • Establishment of the Gliszcz - Wierzchucinek Agricultural Experimental Plant.
• Launching didactic facilities in Osielsko.
1974 • Transformation of the Higher School of Engineering and the Bydgoszcz Branch of the Agricultural University in Poznań at the University of Technology and Agriculture Jan and Jędrzej Śniadecki in Bydgoszcz.
• Laying in the foundation act for the construction of the buildings of the Academic Center in Fordon.
1975 • Reorganization of the structure of the University - establishment of an institute system with the Institutes of: Machine Technology and Operation, Chemical Technology and Engineering, Civil Engineering, Telecommunications and Electrical Engineering, Agriculture, Zootechnics, Mathematics and Physics, Organization, Management and Social Sciences as well as Foreign Languages College, Military College , School of Physical Education and Sport, the Center for Electronic Computational Technology, and the Main Library.
1977 • Commissioning of the first four didactic and scientific buildings in Fordon.
1979 • Establishment of the Small Printing Department.
1984 • Reorganization of the structure o- return to the faculty structure. Creation of the Pedagogical College.
1990 • Commissioning of the building in Fordon for the needs of the Faculty of Agriculture.
1993 • Obtaining by the Faculty of Mechanical Engineering the right to confer the degree of doctor of technical sciences in the discipline of construction and operation of machines.
• Establishment of the University Center for Wide Area Networks. Creation of a university Internet network node.
1994 • Commissioning of a new technological hall for the Faculty of Mechanical Engineering in Fordon.
1995 • Changing the name of the Faculty of Civil Engineering to the Faculty of Civil and Environmental Engineering.
1996 • Creation of the Laboratory of Machine Design in the Department of Machine Design Fundamentals, Military Institute of Medicine, ATR.
1998 • Integration of the Institute of Mathematics and Physics into the Faculty of Chemical Technology and Engineering.
• Completion of the construction of the technological hall in Fordon.
2001 • Obtaining the accreditation of the Polish Center for Accreditation (AB 372) by the Laboratory of Machine Design.
• Commissioning of the "Auditorium Novum" auditorium complex in Fordon.
2002 • Obtaining the right to confer the degree of doctor habilitated in technical sciences in the discipline of construction and operation of machines by the Faculty of Mechanical Engineering.
2006 • Changing the name of the University of Technology and Agriculture into the University of Technology and Life Sciences.
2007 • Opening of the Regional Innovation Center.
2009 • Mechanical Faculty changed its name to Faculty of Mechanical Engineering. An institute structure was introduced.
• Transformation of the Laboratory of Machine Design into the Institute Materials and Structures Testing Laboratory
2014 • Testing of rail vehicles was started in the newly opened Large-Size structures testing laboratory developed in cooperation with PESA within the Institute Materials and Structures Testing Laboratory.
2020 • Return to the cathedral structure at the Faculty of Mechanical Engineering.
• Changing the name of the Institute Materials and Structures Testing Laboratory to the Laboratory for Research on Materials and Structures.
2021 • Relocation of the Laboratory for Research on Materials and Structures from building D to building H.

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