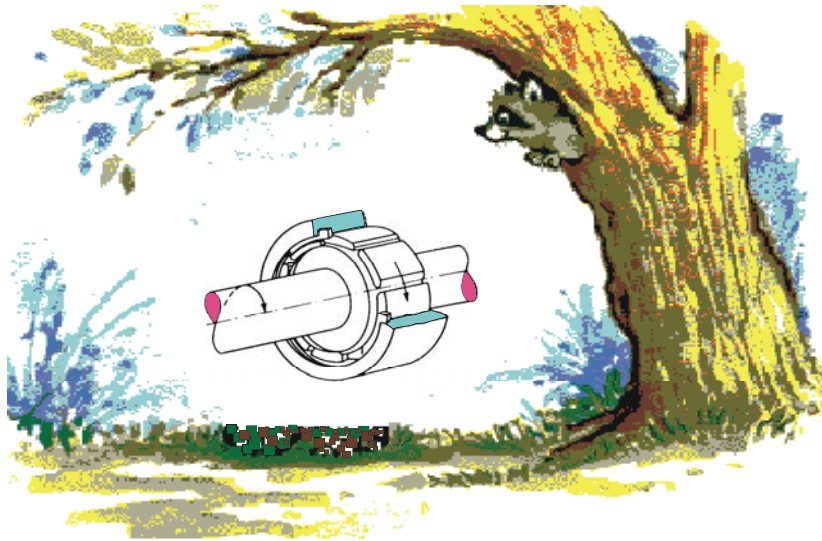


Third International Tribology Conference ITC 2004

Zielona Góra, Poland, August 28-31, 2004



FINAL PROGRAMME

Organized by

Department of Mechanics, University of Zielona Góra

Under the Auspices of

***Polish Tribological Society and
the ASME Tribology Division Int. Com.***

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Third International Tribology Conference, ITC 2004

Zielona Góra, Poland, August 28-31, 2004

Organizing Committee – Staff of the Department of Mechanics, University of Zielona Góra

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Ilciów A.,
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- J. Tichy, *USA*
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- K. Wierzcholski, *Poland*
- J. Wojnarowski, *Poland*
- M. Zarzycki, *Poland*

Preface

Global sustained development of the world science, technology and economy requires better understanding and utilisation of natural resources and also protection of the environment. In this endeavour tribology plays a leading role. Industry and researches need to be made more aware of the potential of tribology and related fields. About 40 years ago, when tribology was shaped, the concept of interrelations between friction, lubrication and wear as a function of interacting elements respectively surfaces, was exemplary from a systems' point of view. The idea of tribology strengthened the request for and also the need of cooperation among different disciplines, which is – in our days – mainly influenced by new possibilities to communicate and to exchange information.

Indeed, cooperational procedures for solving tribology problems are undoubtedly necessary in order to create suitable solutions for concerned tasks of industry: in time and economically as well as ecologically appropriate. Thus the major aim of the Third International Tribology Conference, ITC 2004, – continuing the well-tried concepts of the two last international conferences: Problems of Non-Conventional Bearing Systems, NCBS'99 and the Second International Tribology Conference, SITC 2002, both in Zielona Góra (1999, 2002) – is to bring together tribologists – scientists and practitioners – and to present actual tasks, methods and solutions with respect to friction, lubrication and wear.

The Third International Tribology Conference, ITC 2004, held from August 28 to 31, 2004 in Zielona Góra, will be the third international meeting organized in Poland under the auspices of the ASME – International Committee on Tribology after its formal constitution in 1996.

This volume of the conference proceedings, published as a special issue of the International Journal of Applied Mechanics and Engineering, comprises 51 oral and poster contributions presented at this conference in the following thematic areas:

- fundamentals of friction and wear,
- rolling/sliding contacts,
- lubricant rheology and chemistry,
- tribology of machine elements,
- tribology in extreme environments,
- tribology in processing,
- biotribology,
- fluid film lubrication.

Finally, on behalf of the Organizing Committee, we wish to acknowledge contributions of those who helped to the success of this conference. Important among these is the support of the (Polish) State Committee for Scientific Research.

The Editors,
Anna Walicka, Edward Walicki
August 25, 2004

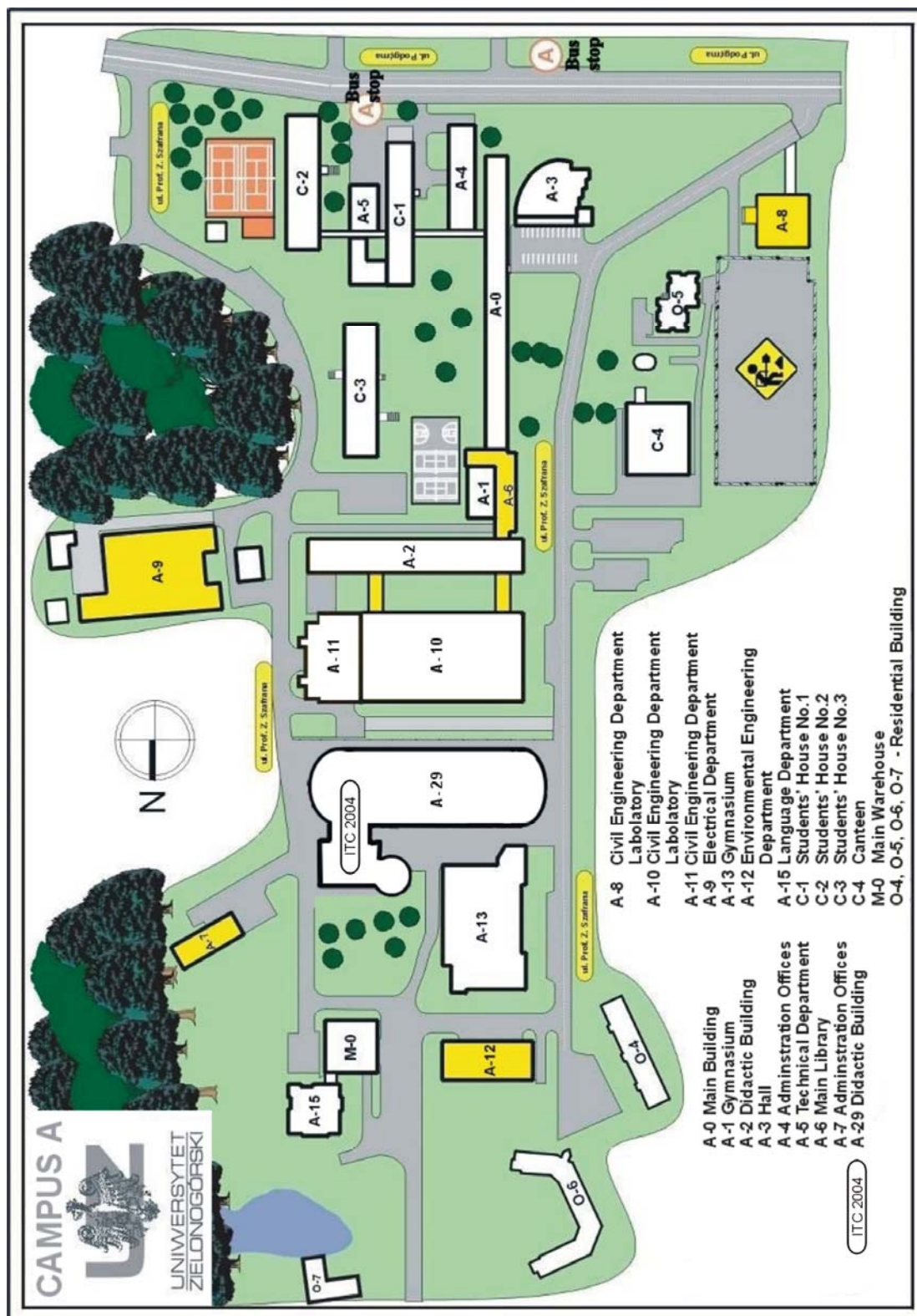
Centre of Zielona Góra



1. University of Zielona Góra (Campus A)
2. Railway Station
3. BUS Station
4. QUBUS Hotel
5. POLAN Hotel
6. ŚRÓDMIEJSKI Hotel
7. Students' House

Venue of the Conference

University of Zielona Góra
(Uniwersytet Zielonogórski, ul. Podgórna 50)



How you can get to the hotels and the Univeristy?

From Railway Station to Hotels:

HOTELS	DISTANCE (walking)
Qubus Hotel	20 min
Śródmiejski Hotel	20 min
Polan Hotel	10 min
Students' House	15 min

From Hotels to the University:

HOTELS	DISTANCE (walking)
Qubus Hotel	15 min
Śródmiejski Hotel	30 min
Polan Hotel	10 min
Students' House	10 min

The approximate cost of taxi is 3US\$ to 5US\$ or 2,5 to 4 Euro. Taking taxi during the night you should add about 20% to the price during a day.

Registration desk

The registration desk is located in the Main Building Foyer A-29 on the ground floor. It will be open throughout the Conference. For the participants arriving on 27 August, it will be open 4:00 pm ÷ 10:00 pm. The next days the registration desk will be open as follows: on August 28 from 8:00 am to 4:30 pm, on August 29 and 30 during the conference.

All participants and accompanying persons should check in at the registration desk upon arrival. The persons which are accommodated in hotels can check in during the first conference morning.

Information for speakers

The speakers should present their contributions in 20 minutes including 5 minutes for discussions. One minute is reserved for the session chairman to present the speaker (his name, affiliation and indication where the paper may be found in the published proceedings).

Audio-visual equipment

Facilities for overhead (transparency), multimedia (Power Point) projections and for slides (35 x 35 mm) will be provided.

Poster

One panel for one poster presentation (dimensions of each are 95 x 95 cm) will be prepared.

Meals

The following meals are prepared and served out at the University Canteen: lunches and dinners.

During the coffee breaks some drinks will be served out.

Liability and insurance

The Organizers cannot accept responsibility for any personal accidents or loss and damage of private property of participants. Participants are kindly requested to make their own insurance arrangements.

Currency

Polish currency is *zloty* (zl. or PLN). 1 Euro is app. 4.75 zl., 1 USD is app. 3.75 zl.

Electricity

In Poland the European (continental) socket-plug system is used. Voltage: 230V, 50Hz.

Guidelines for Session Chairman

Dear Colleague, the Organizers would like to thank you for accepting the role of Session Chairman. To ensure the smooth running of the Session, we would like kindly ask you to note the following guidelines:

- Please attend at the location of your session 10 minutes before the starting time. Presenting authors have been asked to make themselves known to you at this time. Please check with them that their slides/overheads are in order and remind them that their presentation will be of 15 minutes duration, plus 3 or 4 minutes questions/discussion.
- Start the session promptly at the advertised time. Introduce each speaker in turn by name and affiliation and indicate where the paper may be found in the published proceedings.
- Have a question to initiate discussion if no comments are forthcoming from the floor.
- Summary: the authors should not therefore speak for more than 20 minutes including 5 minutes for discussion.

Thank you again for your help in this important role, vital to the smooth running of your session and the whole Conference.

Social programme for delegate

Saturday, 28 August:

In the evening: **Occasional dinner 18³⁰ – 20⁰⁰** – Campus A, Building A-10, room 244

Sunday, 29 August:

Banquet: 19:00-23:00 –“PALMIARNIA” Restaurant (near the Qubus Hotel).

Monday, 30 August:

Evening picnic- Camp-fire and grill in the Sports Center at Drzonków (near Zielona Góra) 18:00-21:30.

Meeting point and departure from the University car park (next to the Building A-29) at **17.45**. Return to Zielona Góra at **22:00**.

Tuesday, 31 August:

All day long excursion to Wolsztyn:

Departure from the Qubus Hotel at 8:00, return to Zielona Góra at 18:00.

After a drive of about 1,5 hours you will reach the roundhouse in Wolsztyn.

After the sightseeing the roundhouse you will be guided to railway station and we will go with special train, driven through steam engine to Grodzisk Wielkopolski. After this travel you will back (by bus) to a restaurant in Wolsztyn for a lunch. Next, you will go to Open Air Museum. After this visit you will return to Zielona Góra and you should be back at 18:00.

Wolsztyn: The steam - house depot, Open Air Museum and Palace

Wolsztyn is situated in the western part of Wielkopolska province, half-way between Zielona Góra and Poznań. The town and commune reside altogether 29.407 inhabitants (with 14.025 living in the town). First mentions about Wolsztyn are dated back to 1424. In Wolsztyn acted (1865-1880) and executed first scientific discoveries prominent doctor and bacteriologist Robert Koch (1843-1910).

The steam - house depot in Wolsztyn is the only please in Europe, where every days trains with old, steam-run locomotives leave in their scheduled route with passengers or cargo.

Open Air Museum of western Wielkopolska folk construction was opened by the Wolszynskie lake in 1986. There are many objects of country architecture, for example still efficient windmill from 1603, old tavern, smithy and many other interesting exhibits.

The palace stands in the park, which was originally built in 1857 in the Neo-renaissance style by Apolinary Gajewski and then rebuilt for the new owner Stefan Mycielski in 1911 in the Neo-classical style by the architect Roger Slawski. The palace was burnt in 1945 and rebuilt in the years 1960-62 as a tourist hostel (without reproducing the antique interiors). The magnificent building has the projection of elongated rectangle and it is covered with the ridge roof, hidden behind the baluster attic. The front facade has been adorned with the six-column portico of pseudo - Ionic order closed with a triangular tympanum at the top. The tympanum has on its surface the shields with the coats of arms of Dolega and Korzbok families.

Social programme for accompanying persons

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Zielona Góra: the city and its vicinity

The city of Zielona Góra is distinguished by its interesting geographical location. Although the town and its vicinity are localised in the centre of the Central European Plain, they are characterised by diverse landscapes typical for the postglacial moraine together with the nearby Wolsztyn and Łagów lake districts, and the highest afforestation in Poland. The town is conveniently located between Berlin, Wrocław, Prague, Poznań, Szczecin and Dresden. Very important communication routes – both rail and road – cross Zielona Góra and connect Scandinavia with the South of Europe (A3), and the nearby A2 between Warsaw and Berlin. Soon, three new lines of trans-European motorways of about 220 km will also go through the region.

For hundreds of years the Piast princes of the Głogów-Żagań line ruled over that territory, later from 1506 for a short time – the Czech Piasts. From 1526 the land together with the Głogów Duchy was incorporated into the Habsburg Monarchy, and after 1740 became a part of Prussia. In 1816 an Englishman O'Brien ran the first mechanical wool factory, and a German Beuchelt in 1876 opened the Steel Construction Factory. After World War II the city came back to Poland and was populated by the local people and settlers from the Eastern territories, which used to belong to Poland before World War II, as well as from

other areas of the country.

The history of this cross-border area with constantly shifting borders and the multicultural heritage of the region prompts the people of the area to seek cultural unity and close ties with other European countries.

Wolsztyn: The steam - house depot, Open Air Museum and Palace

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Schematic programme of the ITC 2004

Saturday, 28 August 2004	
9 ³⁰ – 9 ⁴⁵	Opening Ceremony
9 ⁴⁵ – 10 ¹⁰	Opening Lecture: <i>Prevention against tribocorrosion throughout thermochemical treatment</i> – J. SENATORSKI
10 ¹⁰ – 10 ²⁵	Coffee break
10 ²⁵ – 11 ⁴⁰	Session 1: Lubricant rheology and chemistry
12 ⁰⁰ – 13 ⁰⁰	Lunch – University Canteen
13 ³⁰ – 15 ¹⁰	Session 2: Tribology of machine elements
15 ³⁰ – 17 ⁰⁰	Poster Session I
18 ⁰⁰ – 20 ⁰⁰	Occasional dinner – Building A-10, room 244
Sunday, 29 August 2004	
9 ¹⁵ – 10 ⁰⁵	Session 3: Rolling / sliding contacts
10 ⁰⁵ – 10 ²⁵	Coffee break
10 ²⁵ – 11 ⁴⁰	Session 4: Fundamentals of frictions and wear
12 ⁰⁰ – 13 ⁰⁰	Lunch – University Canteen
13 ⁴⁵ – 15 ⁰⁰	Session 5: Fluid film lubrication
15 ³⁰ – 17 ⁰⁰	Poster Session II
18 ⁰⁰ – 23 ⁰⁰	Banquet – PALMIARNIA Restaurant (near the QUBUS Hotel)
Monday, 30 August 2004	
9 ⁰⁰ – 10 ⁴⁰	Session 6: Biotribology
10 ⁴⁰ – 11 ⁰⁰	Coffee break
11 ⁰⁰ – 12 ¹⁵	Session 7: Tribology in extreme environments I
12 ¹⁵ – 12 ³⁰	Coffee break
12 ³⁰ – 13 ²⁰	Session 8: Tribology in extreme environments II
13 ³⁰ – 14 ³⁰	Lunch – University Canteen

14 ⁵⁰ – 15 ³⁵	Session 9: Tribology in extreme environments III
15 ³⁵ – 16 ⁰⁰	Closing Ceremony
18 ⁰⁰ – 21 ³⁰	Evening picnic – Camp-fire and grill
Tuesday, 31 August 2004 – all day excursion to	
8 ⁰⁰ – 9 ³⁰	Passage to Wolsztyn
9 ³⁰ – 11 ¹⁰	Sightseeing steam-house depot in Wolsztyn
11 ²⁰ – 12 ⁰⁵	Ride special train, driven through steam engine to Grodzisk Wielkopolski
12 ¹⁰ – 12 ⁴⁵	Return by bus to Wolsztyn
13 ⁰⁰ – 14 ³⁰	Lunch in Palace
14 ⁴⁵ – 16 ¹⁵	Sightseeing Open Air Museum in Wolsztyn
16 ¹⁵ – 17 ⁴⁵	Return passage to Zielona Góra

Full programme of the ITC 2004

Saturday, 28 August 2004

9 ³⁰ – 9 ⁴⁵	Opening Ceremony – University Hall	
9 ⁴⁵ – 10 ¹⁰	Opening Lecture: <i>Prevention against tribocorrosion throughout thermochemical treatment</i> – J. SENATORSKI	
10 ¹⁰ – 10 ²⁵	Coffee break – Main Building Foyer	
10 ²⁵ – 11 ⁴⁰	Session 1: Lubricant rheology and chemistry Chairman: B.E. KLAMECKI	<i>Oral Number</i>
10 ²⁵ – 10 ⁵⁰	<i>Influence of biodegradable lubricants on tribological characteristics of aluminium alloy</i> M. MURAKI, K. WASHINO, A. SUZUKI	O-1
10 ⁵⁰ – 11 ¹⁵	<i>Transparent highly viscous lubricants to lubricate girth gears drives, field findings on hand of an example</i> W. GSCHWANDTNER	O-2
11 ¹⁵ – 11 ⁴⁰	<i>Influence of atmospheric gas upon seizure of gas bearings</i> P. KARPOV, M. HARADA, J. TSUKAZAKI, H. YAMAMOTO	O-3
12 ⁰⁰ – 13 ⁰⁰	Lunch – University Canteen	
13 ³⁰ – 15 ¹⁰	Session 2: Tribology of machine elements Chairman: M. MURAKI	O.N.
13 ³⁰ – 13 ⁵⁵	<i>Lubricity of oils used in porous bearings</i> A. KRÓL and T. KAŁDOŃSKI	O-4
13 ⁵⁵ – 14 ²⁰	<i>The investigations of friction and wear of porous bearings lubricated by greases</i> B. GIEMZA and T. KAŁDOŃSKI	O-5
14 ²⁰ – 14 ⁴⁵	<i>Thermal processes at high-speed friction</i> D.V. TKACHUK and P.N. BOGDANOVICH	O-6
14 ⁴⁵ – 15 ¹⁰	<i>Magnetically active lubricants – new possibilities and perspectives</i> J. BURCAN	O-7
15 ³⁰ – 17 ⁰⁰	Poster Session I – Main Building Foyer	
18 ⁰⁰ – 20 ⁰⁰	Occasional dinner – Building A-10, room 244	

Poster Session I

Fundamentals of friction and wear	
P-1	<i>Abrasive wear of sinters based on Fe-40Al phase</i> T. DUREJKO, Z. BOJAR
P-2	<i>Abrasive wear of Ni₃Al – based intermetallic alloy</i> Z. BOJAR, P. JOZWIK, C. PAKOWSKI
P-3	<i>Factors influencing abrasive wear of gas detonation sprayed FeAl – based intermetallic coatings</i> C. SENDEROWSKI and Z. BOJAR
P-4	<i>Wear of cutting edges during Fe-Al intermetals turning</i> I. ŁOSIK, Z. ZARAŃSKI, S. SULEJ and T. DUREJKO
P-5	<i>Tool wear prediction in machining by using the adaptive neuro-fuzzy system</i> U. ZUPERL, M. MILFELNER and F. CUS
P-6	<i>Influence of ageing on kinetics of epoxy coatings erosive wear</i> D. KOTNAROWSKA and A. KOTNAROWSKI
Lubricant rheology and chemistry	
P-7	<i>Palm oil-based cutting fluids</i> S. RAADNUI and S. MAHATHANABODEE
P-8	<i>Palm oil as hydraulic fluids</i> S. RAADNUI
P-9	<i>Significance meaning of texture direction of surface's geometric structure for course of wear process</i> M. MATUSZEWSKI and M. STYP-REKOWSKI
P-10	<i>Surface layer transformation under external extortions</i> J. MUSIAŁ and M. STYP-REKOWSKI
Tribology of machine elements	
P-11	<i>Research regarding the durability of face seals used for centrifugal pumps in the petrochemical industry</i> N. POPA, M. ENESCU
P-12	<i>Statistical calculus of wear for the sliding rings in face seal</i> N. POPA, M. ENESCU
P-13	<i>Determination of the optimal strategy for preventive maintenance of the clutch motor vehicles using polycriterion optimization</i> B.V. KRSTIĆ

Sunday, 29 August 2004

$9^{15} - 10^{05}$	Session 3: Rolling / sliding contacts Chairman: J.A. ABDO	<i>O.N.</i>
$9^{15} - 9^{40}$	<i>Multi-parameter analysis condition monitoring technique for grease-lubricated rolling element bearings</i> S. RAADNUI	<i>O-8</i>
$9^{40} - 10^{05}$	<i>An integrated approach condition monitoring of grease-lubricated rolling element bearings</i> S. RAADNUI	<i>O-9</i>
$10^{05} - 10^{25}$	Coffee break	
$10^{25} - 11^{40}$	Session 4: Fundamentals of frictions and wear Chairman: J. SENATORSKI	<i>O.N.</i>
$10^{25} - 10^{50}$	<i>Wear of triboconjugation from a position of damages accumulation in the plastic contact condition</i> V.V. KHARLAMOV	<i>O-10</i>
$10^{50} - 11^{15}$	<i>Comparative performance analysis and modeling of tool wear in drilling</i> C.C. WEN, L.T. SOON and SIVARAO	<i>O-11</i>
$11^{15} - 11^{40}$	<i>A wear model for rough surfaces based on the ultimate-stress asperity concept</i> J.A. ABDO and A.S. AL-YAHMADI	<i>O-12</i>
$12^{00} - 13^{00}$	Lunch – University Canteen	
$13^{45} - 15^{00}$	Session 5: Fluid film lubrication Chairman: K.CH. WIERZCHOLSKI	<i>O.N.</i>
$13^{45} - 14^{10}$	<i>An analytical solution for the pressure field in the long porous journal bearings</i> V. D'AGOSTINO, D. GUIDA, A. RUGGIERO and A. SENATORE	<i>O-13</i>
$14^{10} - 14^{35}$	<i>Theoretical investigation on the static properties of the finite porous journal bearings</i> V. D'AGOSTINO, D. GUIDA, A. RUGGIERO and A. SENATORE	<i>O-14</i>
$14^{35} - 15^{00}$	<i>Comparative analysis and modeling of surface roughness in drilling</i> C.C. WEN, L.T. SOON and SIVARAO	<i>O-15</i>
$15^{30} - 17^{00}$	Poster Session II – Main Building Foyer	
$18^{00} - 23^{00}$	Banquet – PALMIARNIA Restaurant (near the QUBUS Hotel)	

Poster Session II

Tribology in processing	
P-14	<i>Simulation of the sheet-metal forming process with changeable holding force and different frictional resistance</i> J. ADAMUS
P-15	<i>Simulation of friction in upsetting process</i> P. LACKI
Biotribology	
P-16	<i>Modification of oils with use of metal micro- and nano-powders</i> A. KOTNAROWSKI
P-17	<i>Tribological properties of biomaterials and hardening layers used in joint arthroplasty</i> M. GIERZYŃSKA-DOLNA, J. ADAMUS and P. LACKI
Rolling / sliding contacts	
P-18	<i>Surface durability of steel rollers lubricated by fresh and used engine oils in comparison with gear oil</i> A. ISHIBASHI, K. SONODA, Y. SUNAGAWA and R. SHOJI
Fluid film lubrication	
P-19	<i>Rotational inertia and roughness effect in curvilinear thrust bearings</i> A. WALICKA and E. WALICKI
P-20	<i>Inertia effect in the curvilinear thrust bearing lubricated by a power law ferrofluid</i> A. WALICKA and B. WILEWSKI
P-21	<i>Performance of a thrust bearing lubricated by a bingham ferromagnetic lubricant</i> A. WALICKA and B. WILEWSKI

Monday, 30 August 2004

$9^{00} - 10^{40}$	Session 6: Biotribology Chairman: S. RAADNUI	<i>O.N.</i>
$9^{00} - 9^{25}$	<i>Optimization and control of tissue growth and repair in bioreactor</i> K.CH. WIERZCHOLSKI	<i>O-16</i>
$9^{25} - 9^{50}$	<i>The integrals of velocity near the tissue in bioreactor</i> K.CH. WIERZCHOLSKI	<i>O-17</i>
$9^{50} - 10^{15}$	<i>Tribology of stochastic phenomena on the hard tissue</i> K.CH. WIERZCHOLSKI	<i>O-18</i>
$10^{15} - 10^{40}$	<i>Engineering contribution for cartilage cultivation in bioreactor</i> K.CH. WIERZCHOLSKI	<i>O-19</i>
$10^{40} - 11^{00}$	Coffee break	
$11^{00} - 12^{15}$	Session 7: Tribology in extreme environments I Chairman: B. GIEMZA	<i>O.N.</i>
$11^{00} - 11^{25}$	<i>Erosion resistance of ARC – method sprayed coatings for wear at elevated temperature</i> K. SZYMANSKI and B. FORMANEK	<i>O-20</i>
$11^{25} - 11^{50}$	<i>Control of the cultivation of cartilages for using in the biobearings</i> M. H. GHAEMI	<i>O-21</i>
$11^{50} - 12^{15}$	<i>Lubricants in contact with drinking water –toxicological aspects and evaluation of new raw materials</i> M. SCHMIDT-AMELUNXEN	<i>O-22</i>
$12^{15} - 12^{30}$	Coffee break	
$12^{30} - 13^{20}$	Session 8: Tribology in extreme environments II Chairman: V.V. KHARLAMOV	<i>O.N.</i>
$12^{30} - 12^{55}$	<i>Research work on water lubricated polymer hydrodynamic bearing</i> W. LITWIN	<i>O-23</i>
$12^{55} - 13^{20}$	<i>Effects of pulsed magnetic field on rolling contact bearings</i> B.E. KLAMECKI	<i>O-24</i>
$13^{30} - 14^{30}$	Lunch – University Canteen	

14 ⁵⁰ – 15 ³⁵	Session 9: Tribology in extreme environments III Chairman: A. KRÓL	<i>O.N.</i>
14 ⁵⁰ – 15 ¹⁵	<i>Analysis of worn surfaces by a slicing method</i> Á. CZIFRA, K. VÁRADI, B. PALÁSTI KOVÁCS	<i>O-25</i>
15 ¹⁵ – 15 ³⁵	<i>Investigation of noise and vibration at frictional contact in mechanical systems</i> J.A. ABDO	<i>O-26</i>
15 ³⁵ – 16 ⁰⁰	Closing Ceremony	
18 ⁰⁰ – 21 ³⁰	Evening picnic: Camp-fire and grill	

Tuesday, 31 August 2004 – all day excursion to

8 ⁰⁰ – 9 ³⁰	Passage to Wolsztyn
9 ³⁰ – 11 ¹⁰	Sightseeing steam-house depot in Wolsztyn
11 ²⁰ – 12 ⁰⁵	Ride special train, driven through steam engine to Grodzisk Wielkopolski
12 ¹⁰ – 12 ⁴⁵	Return by bus to Wolsztyn
13 ⁰⁰ – 14 ³⁰	Lunch in Palace
14 ⁴⁵ – 16 ¹⁵	Sightseeing Open Air Museum in Wolsztyn
16 ¹⁵ – 17 ⁴⁵	Return passage to Zielona Góra

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