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Sweden:	C. Leygraf, Royal Institute of Technology
Switzerland:	Heinrich Merz/Werner Johler Tyco Electronics AXICOM
United Kingdom:	J.B.P. Williamson, Williamson Interface Ltd.
USA:	Paul G. Slade, Eaton Electrical/Eaton Corporation

Purpose

To provide a forum for the presentation and discussion of the latest developments in the field of electric contacts, as well as, the application of recent advances in materials and processes in electrical, electronic and telecommunications equipment.

For Whom

Practicing designers, engineers, physicists, and research scientists—those new to the field and those experienced. The 2004 International Conference on Electrical Contacts together with the IEEE Holm Conference will include excellent papers authored by some of the outstanding technical people in this field. The international contributors come from the USA, Austria, Belgium, Canada, China, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Korea, Netherlands, Norway, Poland, Switzerland, and United Kingdom. These papers will provide the attendees with up-to-date information on a wide range of subjects that makes this conference so attractive to the practicing engineer.

Additionally, the 2004 International Conference on Electrical Contacts together with the IEEE Holm Conference will make it possible for any attendee to discuss personally, with any author, either additional details concerning the work presented by the author at the conference or any subject related to the author's field of expertise.

Background

The first International Conference on Electric Contacts (1961) was organized by the predecessor of the Holm Conference Organization (the Holm Seminar Organization) and held in Orono, Maine, U.S.A. It was developed with the cooperation of similar Conference Organizations in Europe and Asia to provide an open, international forum to discuss the whole range of electrical contact research. It was also recognized that there was a need for a meeting place where the international researchers in the field could become personally acquainted and, over the years, some lasting friendships have developed across wide stretches of ocean. Since 1961 there have been 21 International Conferences, which have been held in North America, Europe and Asia: this present Conference being the 22nd. The Holm Conference began in 1953 as the Holm Seminar where Dr. Ragnar Holm presented a discussion of electrical contact phenomena. This early beginning developed into the present Holm Conference where researchers in the field could present their latest work. The Holm Conference took its present name in 1968 in honor of Dr. Holm, whose research into electrical contact phenomena spanned 50 years and formed the foundation of the field. The Holm Conference has hosted 7 of the previous International Conferences on Electric Contacts and, this year, the 50th Holm Conference is honored to be the host for the 22nd.

Registration

All Participants are encouraged to pre-register to avoid lines at the conference and to obtain the discounted fee.

Advance Registration Prior to 8/20/2004	IEEE Member	\$550
	Non-Member	\$600
	Student	\$200
	Extra Proceedings	\$ 70
	Guest Ticket for Conference Dinner	\$ 90
After 8/20/2004 & On-Site	IEEE Member	\$610
	Non-Member	\$660
	Student	\$250
	Guest Ticket for Conference Dinner	\$ 90

REGISTRATION HOURS

Sunday, September 19	4:00 p.m. – 6:00 p.m.
Monday, September 20	7:00 a.m. – 5:00 p.m.
Tuesday, September 21	7:30 a.m. – 4:00 p.m.
Wednesday, September 22	8:00 a.m. – 4:00 p.m.
Thursday, September 23	8:00 a.m. – 10:00 a.m.

Registration can be completed online:
www.ewh.ieee.org/soc/cmpt/tc1/

Registration payments: Checks are to be made out to the IEEE HOLM in U.S. funds. Visa, MasterCard, American Express and wire transfers are also accepted. Please mail your payment along with the enclosed registration form to:

IEEE Holm Conference
IEEE Conference Management Services
445 Hoes Lane
Piscataway, NJ 08854
Or fax to +1 732 465 6447

For additional information please contact Holm Registrar, at +1 732 562 5337, via fax to +1 732 465 6447, or email: r.boles@ieee.org.

Hotel

The conference this year meets in Seattle, WA at the Sheraton Hotel & Towers where meeting facilities are well suited to the Conference Sessions and other activities. The hotel is offering special rates of \$174.00 US dollars single/double occupancy to conference attendees. Rates are subject to applicable state, local and occupancy taxes: approximately 15.6%. To make a reservation please call the Sheraton Hotel at +1 206 621 9000 and identify yourself as part of the IEEE Holm Conference in order to receive the special group rate. The special rate is valid until August 26, 2004, reservations received after this date are subject to space and availability.

Check in time: 3:00 p.m. Check out time: 12:00 p.m.

Transportation

TRAVEL ARRANGEMENTS

Special discounted airfares for the 2004 Holm Conference being held on September 20-23, 2004 in Seattle, WA have been negotiated by IEEE Travel Services. Discounts are as high as 20% off the lowest published airfares with Continental, Southwest, and United Airlines. If Saturday night stays or super-saver airfares are not applicable, deeply discounted airfares are available. Discount code A606098 entitles attendees to receive special rates that have also been negotiated with Avis Rental Car Company, Budget X520000, Hertz Corporate Code 61368/Permission Code 937661, and Enterprise NA24IEI.

Travel arrangements using the negotiated air carriers or the carriers of your choice can be made through IEEE Travel Services by **calling between the hours of 8:30 a.m. and 5:30 p.m. EST. Monday through Friday. Within the US and Canada, call (800) TRY-IEEE, (+1 800 879 4333); and outside of the US and Canada, call +1 732 562 5387.** Or, you may visit their on-line travel service web site at <http://www.ieee-travelonline.org>. This secure site offers simple and convenient service through which you can search, reserve, and ticket your travel anytime, anywhere. Or, you can e-mail your request to travel-team@ieee.org.

You may also your fax requirements to the IEEE Travel Services at + 732 562 8815. When faxing, please be sure to include your travel dates, departure, and return times, and phone and fax numbers. A Travel Counselor will contact you promptly.

Local Transportation

The Sheraton Hotel & Towers is located at 1400 Sixth Avenue, Seattle, WA 98101.

Transportation From Airports

Taxis

Cost is \$30-\$35 from Seattle Tacoma International Airport.

Transportation

Grayline Express is an Airport Coach to the Downtown Hotels which costs \$14 round trip. Reservations are not required. Please call +1 800 426 7532 for more information.

Driving

If you are arriving by your own transportation and you wish to park at the Sheraton Hotel valet parking at \$28/day and self-parking at \$26/day are available. For specific driving directions, consult Mapquest at <http://www.mapquest.com> or call the hotel directly at +1 206 621 9000.

Nestled in the city's vibrant core, The Sheraton Seattle Hotel and Towers is a gateway to all the sights, sounds, and experiences of the fabulous Northwest. The best of Seattle is found just outside the front doors, from exciting nightlife to gourmet restaurants, world-class shopping, and of course, the heart of the financial and business district.

Social Events

Wednesday, 22 September

Conference Dinner at Kiana Lodge

5:00pm - 10:00pm

Dinner is included with Conference Registration.

The cost for an extra guest ticket is \$90.00.

For a true Northwest experience, this scenic cruise aboard a private boat through Puget Sound is followed by a delicious buffet dinner. Kiana Lodge is a private six-acre waterfront retreat located approximately one hour from downtown Seattle by boat. Originally built in the 1930's as a lodge club house for those Seattle area residents seeking a summer escape, the lodge was the focal point for gatherings of all ages with food, drink, games, dancing and out door activities. In 1944, the lodge was purchased by a private party and was given the name "Kiana: which means "Garden of the Gods" in the Native American language.

Guests will be transferred via motorcoach to Pier 55, where you will board a private boat for the lovely cruise to Kiana Lodge. After a leisurely cruise, you arrive at Kiana and are greeted by the friendly staff and invited to explore this lush setting filled with tall firs, fragrant cedars and colorful flowers. Stroll along the sandy beaches that are carpeted by white clamshells, sand dollars and other shells. Guests will not be able to miss the fabulous gardens, which are meticulously cared for by a team of gardeners. Steamer clams in delicious clam nectar are offered as a warming appetizer to enjoy while you explore the grounds.

A roaring bonfire on the beach will warm guests as they recount the night's festivities. The perfect ending to this memorable evening is the magnificent nighttime view of the glittering Seattle skyline from the water on their return cruise.

Buffet Menu

Starter

Steamed Clams and Clam Nectar

Entrée and Accompaniments

Alder Roasted Salmon

BBQ Chicken

Rosemary Oven Roasted New Potatoes

Kiana's Signature Coleslaw with Parmesan-Vinaigrette Dressing

Fresh Seasonal Vegetables

Rolls & Butter

Dessert

Raspberry and Chocolate Chip Scone Shortcake with Fresh Whipping Cream

Companion/Guest Tours

Monday, 20 September

Seattle City Tour Including Glass Demonstration - \$27.00
8:30am - 12:30pm - (lunch on your own)

A drive over one of Seattle's two floating bridges will provide views of beautiful Lake Washington and its surrounding homes. A stop at the Hiram M. Chittenden Locks will show how the area's fresh and salt waters meet, and guests will enjoy the underwater viewing at the adjoining salmon ladders. Next, guests will surely enjoy a stop at Seattle's renowned Pike Place Market, an exciting array of color, aroma and sounds! There will be time to shop and explore this fascinating area, and easy-to-read maps will be provided for those who wish to linger on their own.

Following an interesting city tour, guests are invited to Blowing Sands where they will be given insight into the world of Seattle glass artist, David Smith. Your guests will view an artist demonstration and be given a chance to purchase glass art, if they desire to.

Includes:

Guided City Tour
Map of Pike Place Market
Blowing Sands Tour
Artist Demonstration
One-Way Monorail Ticket Per Guest
Motorcoach Transportation

Note: Light jackets and comfortable shoes are recommended.

Tuesday, 21 September

Afternoon Lakes Cruise - \$53.00
12:30pm - 3:30pm - (lunch on your own)

This fabulous two-hour cruise treats your group to spectacular glimpses of Seattle's unique inner-city shoreline. Guests will cruise through Lake Union and Portage Bay, viewing everything from million dollar mansions including Bill Gate's, Kenny G, the Nordstrom family, and Steve Miller to handcrafted houseboats - even the famous houseboat from *Sleepless in Seattle!*

Guests will learn interesting facts such as: Seattle has more pleasure boat owners per capita than any other metropolitan city; Seattleites buy more sun glasses per capita than any other city in the nation; and Washington State has three of the world's six floating bridges including the Evergreen Point Floating Bridge which is the longest pontoon bridge in the world! This informative tour will also reveal interesting facts about houseboats including houseboats with basements!

Includes:

Public, Narrated Lakes Cruise
Motorcoach Transportation

Onsite tickets for tours are subject to availability. No refunds or exchanges after August 23, 2004. The conference reserves the right to cancel and refund the ticket price if the minimum number of tickets are not sold. If a tour is cancelled you will receive a full refund. All tours are conducted by Seattle Hospitality Services. Tours depart on time. There are no refunds for missed tours. Tour fees include transportation, admission fees, taxes and gratuities to tour guides and drivers. Seating is limited for each tour.

IEEE Holm Conference Ragnar Holm Scientific Achievement Award Nomination Guidelines

History: The Ragnar Holm Scientific Achievement Award was created by the 1971 Holm Conference Steering Committee in honor of the memory of Dr. Ragnar Holm, the founder of the modern science of electrical contacts. This award is to be granted to the living scientist or engineer who has made significant contributions to the theory or practice of electrical contacts, or for work in related technologies which is directly applicable to contacts. In considering a person's work and selecting a recipient preference will be given for: a.) Nominees that have made contributions to the technology over many years, b.) the originality and scientific importance of contributions, and c.) achievements that have found a high degree of practice. Provided worthy candidates are found, the Award will be granted annually.

Eligibility: Any person may be nominated for this award regardless of IEEE membership. Members of IEEE Holm Awards and Nomination Committee are not eligible to be considered for the award while serving on these committees. Nominations are not accepted for persons deceased. Candidates must have made contributions to the electrical contact field for a period spanning at least ten years.

Nominator Eligibility: Any person may nominate a candidate for this award, with the following exception: members of the award committee.

Nomination Support Materials:

Endorsers: At least two letters of endorsement are required. One is from the nominator and the others are from the endorsers selected by the nominator. Endorsers should be in a position to substantiate the candidate's contributions by providing explicit detail from personal knowledge. The nominator is responsible for submission of the letters of endorsement.

Candidate Personal Data/Education/Work: "Name", provide complete name of candidate, not initials. "Personal", provide date of birth, and citizenship. "Education", list year and exact degree of institute. "Society Membership", list various professional society affiliations. Under society activities list officers and major committee work. "Professional History", list present

occupation followed by previous career experiences. Indicate positions held, years, and briefly explain each responsibility.

Technical Accomplishments: "Technical Publications", such as books, papers, reports, and standards are to be listed in chronological order giving author's names, title, book, journal, or proceedings. "Patents", should be listed by date, number, title, and country of origin. Documentation authentication "Development of Products or processes", may be listed for items not covered by patents. "Technical Presentations", such as keynote addresses or courses developed by the candidate should also be listed.

Significant Contributions: Describe the candidate's outstanding contributions in terms of specific items. Provide a short paragraph to each one including a general description of the item, the degree of originality and creativity, and importance of the work to the electrical contact field and the time period over which the contribution was made. Also state cases of examples of practices which were developed or modified through contributions of the candidate.

Forward Nominations To: IEEE Holm Nominations Committee, c/o IEEE Holm Conference Administrator, 445 Hoes Lane, Piscataway, NJ 08854 USA

Nominations Deadline: November 15, 2004

Holm 2005

The 51st IEEE Holm Conference on Electrical Contacts will be held September 26-28, 2005 at the Holiday Inn Chicago City Centre, IL.

Prospective authors should submit a brief abstract (200 words maximum) online before December 15, 2004. Authors will be notified concerning acceptance of abstracts in mid-February 2005. Please include complete contact information for all correspondence to be sent.

**Abstracts are to be submitted through the IEEE
Conference eXpress website:**

<http://www.ieee.org/conferencepublishing>

Enter Conference ID - holm05 (please use lower case)

Important Dates

December 15, 2004	Abstract Deadline
February 15, 2005	Notification of Acceptance
April 8, 2005	Completed Paper Deadline
September 26, 2005	Conference Begins

Correspondence Address

IEEE Conference Management Services
IEEE Holm Conference (2005)

445 Hoes Lane

Piscataway, NJ 08854

tel: +1 800 810 4333 or +1 732 562 5350

fax: +1 732 981 1203

email: m.curtis@ieee.org

Holm Web site: www.ewh.ieee.org/soc/cpmt/tc1/

Morton Antler Lecture

The Morton Antler Lecture is an annual lecture given at the IEEE Holm Conference on a topic of special interest to the electrical contact community. This lecture series was established in honor of Dr. Morton Antler, a long time member of the Holm Steering Committee and participant in the Holm Conference. Dr. Antler was a distinguished scientist and lecturer in the fields of electrical contacts, tribology, corrosion, and electrodeposition.

2004 Morton Antler Lecture

A Perspective on Connector Reliability

Dr. Robert S. Mroczkowski, Principal
connNtext associates
Manheim, PA

Dr. Mroczkowski is a Principal in connNtext associates, a firm providing consulting services in connector applications. He holds S.B, S.M and Sc.D degrees in Physical Metallurgy from the Massachusetts Institute of Technology and has over thirty years experience in various aspects of the electronics industry. Dr. Mroczkowski joined AMP Incorporated in 1971 and retired in 1998 as an AMP Principal. While at AMP his responsibilities included consulting on connector design/materials/reliability within AMP and providing an interface to AMP customers on the same issues. He is the author of the McGraw Hill Electronics Connector Handbook, has contributed chapters on connectors and interconnections to a number of packaging handbooks, and written more than twenty technical papers. He holds seven patents. In 1997 he received the Lifetime Achievement Award of the International Institute of Connector and Interconnection Technology. Dr. Mroczkowski founded connNtext associates in 1998. He is currently an adjunct faculty member in the Computer Aided Life Cycle Engineering (CALCE) program at the University of Maryland.

**50th IEEE Holm
Conference on Electrical
Contacts Contributors**

**JOINT WITH THE
22ND INTERNATIONAL
CONFERENCE ON
ELECTRICAL CONTACTS**

CONTRIBUTORS

Platinum Level

AMI Doduco
Checon Corporation
Chugai USA Inc.
SCHWARZKOPF TECHNOLOGIES LLC
Umicore AG & Co. KG

Gold Level

Eaton Electrical
Research and Engineering Society for
Electromechanical Components and
Contact Technology in Japan
TMI

Silver Level

Rockwell Automation

Bronze Level

Brainin Advance Industries, Inc.
ECL
Molex Inc.
Moog Components Group (Formerly Poly-Scientific)
Nye Lubricants, Inc. - The Smart Grease Company

WITH COOPERATION FROM

ABB Switzerland AG
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AREVA T&D - ARC
Auburn University
Austrian Center of Competence
for Tribology
Beijing University of Posts &
Telecommunications
Chemnitz University of Technology
Chitose Institute of Science &
Technology
Chugai USA, Inc.
CMOM, Université Nice-Sophia
Antipolis
connNtext associates
Delphi Packard Electric Systems
Delphi Research Labs
Delphi-TCF
Deringer-Ney, Inc.
Dresden University of Technology
Eaton Corporation
École de technologie Supérieure
Eidgenössische Technische
Hochschule
Elektro-Metall AG
E-TA GmbH
European Patent Office
FCI Research Center
FCI USA, Inc.
FCI, Corporate Research Center
Fujitsu Laboratories Ltd.
Harbin Institute of Technology
HARTING KGaA
Hebei University of Technology
Hyogo University of Teacher
Education
Institut de Recherche d'Hydro-
Québec
Institute of Electronic Materials
Technology
Ishinomaki Senshu University
ISTEC-Superconductivity
Research Laboratory
JSR Corporation
Keio University
Kogakuin University
Laboratoire d'Électrotechnique de
Montluçon
LG Industrial Systems Co., Ltd
LGEP, Supélec
LISE, Facultés Universitaires
Notre-Dame
Lumberg Connect GmbH&Co.KG
Massachusetts Institute of
Technology
Matsushita Electric Works
(Europe) AG
MB Interface
Memscap, Inc., RTP
Metalor Contacts France
Metalor Technologies (France)
SAS
Military University of Technology
Moeller GmbH
Molex, Inc.
National Technical University of
Athens
NEC/TOKIN IWATE Corporation
Norwegian University of Science
and Technology
Railway Technical Institute
RD Malucci Consulting
Rockwell Automation AG
Schaltbau GmbH
Schneider Electric Industries
Schneider Electric SA
Shibaura Institute of Technology
Shijiazhuang Railway Institute
Shizuoka University
Siemens AG
SINTEF Energy Research
Solvay Solexis S.p.A.
Space Group, COM DEV Ltd.
Starkstrom-Gerätebau GmbH
Sungkyunkwan University
Tanaka Kikinzoku Kogyo
Technical University of Lodz
Technical University of Tampere
Technische Universität
Braunschweig
Technische Universität München
Technology Center, Plansee AG
Teradyne Connection Systems
The Hong Kong Polytechnic
University
Timron Scientific Consulting Inc.
Tohoku Bunka Gakuen University
Toyota Motor Corporation
Tribotek, Inc.
Tyco Electronics
Tyco Electronics Axicom, Au-
Waedenswil
Umicore AG & Co. KG
Universités Paris VI et Paris XI
University of Rennes1
University of Southampton
University of Tokyo
University of Victoria
Vienna University of Technology
Warsaw University of Technology
Wright Patterson AFB
Xi'an Jiaotong University

Technical Program

MONDAY, SEPTEMBER 20, 2004

8:00am

INTRODUCTION and OPENING REMARKS

Paul Slade, 2004 Holm Conference Chair

8:15am

Holm Award

Arc Discharge and Contact Reliability in Switching and Commutating Contacts

Prof. Koichiro Sawa, Keio University

9:15am - 9:30am

Break

9:30am - 10:45am

Automotive I

Chair: Thomas Schoepf

Co-Chair: Ed Smith

1.1 **Micro-Arcing and Arc Erosion Minimisation Using a 42 Volt DC Hybrid Switching Devices**

J. Swingler, J.W. McBride, University of Southampton, United Kingdom

1.2 **Electrical Arc Phenomena and Its Interaction on Contact Material at 42 Volts DC for Automotive Applications**

L. Doublet, Metalor Technologies (France) SAS, France; N. Ben Jemaa, University of Rennes1, France; F. Hauner, D. Jeannot, Metalor Technologies (France) SAS, France

1.3 **Evaluation of Arcing Damage on Connector for 42V Automotive Power Net**

J. Razafiarivelo, M. Porte, FCI Research Center, France; N. Ben Jemaa, A. El Manfalouti, University of Rennes I, France

1.4 **Investigation of Contact Materials in 42VDC Automotive Relay**

Koya Takahashi, Osamu Sakaguchi, Toshiya Yamamoto, Tanaka Kikinzoku Kogyo, Japan; Hiroya Inaoka, Toyota Motor Corporation, Japan

10:45am-11:00am

Break

11:00am - 12:30pm

Arc Interruption I

Chair: Eugeniusz Walczuk

Co-Chair: John Shea

2.1 **The Process of Arc-Splitting Between Metal Plates in Low Voltage Arc Chutes**

Manfred Lindmayer, Erik Marzahn, Alexandra Mutzke, Thomas R  ther, Matthias Springstubbe, Technische Universit  t Braunschweig, Germany

2.2 **Simulation of the Temporal Behavior of Circuit Breakers and Motor Starters**

Hartwig Stammberger, Heinz Pursch, Albert Zacharias, Peter Terhoeven, Moeller GmbH, Bonn, Germany

2.3 **A Study on Flow Characteristics of a Thermal Expansion Circuit Breaker Near the Current Zero Period**

Jong-Chul Lee, LG Industrial Systems, Cheongju, Korea; Youn J. Kim; Sungkyunkwan University, Suwon, Korea

2.4 **Observation of Arc-emitted Light between Slowly Opening Electrical Contacts using a High-speed Camera**

Junya Sekikawa, Tetsuya Kitajima, Takayoshi Endo, Takayoshi Kubono, Shizuoka University, Hamamatsu, Japan.

2.5 **Commutation Process in Gas Circuit Breakers: Close-Operation and Commutation Failure During an Open-Operation**

T. Schoenemann, J. Kiefer, ABB Switzerland Ltd, Z  rich, Switzerland; S.-Y. Leung, The Hong Kong Polytechnic University, Hong Kong, China; B. Oerzen, University of Victoria, British Columbia, Canada; T. Inkinen, Technical University of Tampere, Tampere, Finland; P. Huguenot, Eidgen  ssische Technische Hochschule, Z  rich, Switzerland

2.6 **Development of New Electrical Contacts for High Voltage Applications**

O. Visata, J.L. Bessedes, AREVA T&D - ARC, Villeurbanne, France

12:30pm - 2:00pm

Lunch on Your Own

2:00pm - 3:30pm

Materials I

Chair: C. Leygraf

Co-Chair: Phil Wingert

- 3.1 Welding Behavior of Ag/SnO₂ Contact Material with Microstructure and Additive Modifications**
Chi Leung, Eric Streicher, Dennis Fitzgerald, AMI DODUCO
- 3.2 Replacement of AgCdO by AgSnO₂ in DC Contactors**
O. Nilsson, Schaltbau GmbH, Munich, Germany; F. Hauner, D. Jeannot, Metalor Contacts France, Courville, France
- 3.3 Arc Erosion Tests and Study of Surface of Ag-WC Contacts after Arc Switching Operations**
K. Kaliszuk, K. Frydman, D. Wójcik-Grzybek, W. Bucholc, Institute of Electronic Materials Technology, Poland; E. Walczuk, P. Borkowski, Technical University of Lodz, Poland; D. Zasada, Military University of Technology, Poland
- 3.4 An Evaluation Method of the Contact Erosion Based on the DC Mode Test of Electromagnetic Contactor**
Yosuke Kawakami, Masaaki Takashima, Keio University, Yokohama, Japan; Makoto Hasegawa, Chitose Institute of Science and Technology, Chitose, Japan; Yoshitada Watanabe, Kogakuin University, Tokyo, Japan; Koichiro Sawa, Keio University, Yokohama, Japan
- 3.5 The Influence of Manufacturing Process, Metal Oxide Content, and Additives on the Switching Behaviour of Ag/SnO₂ in Relays**
Peter Braumann, Andreas Koffler, Umicore AG & Co. KG, Hanau, Germany

3:30pm - 3:45pm

Break

3:45pm - 4:45pm

Contact Phenomena

Chair: A. Steinmetz

Co-Chair: Chi Leung

- 4.1 An Updated View of the Aluminum Contact Interface**
J. Aronstein, Consulting Engineer, Poughkeepsie, NY
- 4.2 Advanced Thermal Simulation of a Circuit Breaker**
Peter U. Frei, Hans O. Weichert, Rockwell Automation AG, Switzerland
- 4.3 Optimal Design of Generator Circuit Breakers up to a Capacity of 2000 MVA using Thermal Models - under Consideration of Electrical and Thermal Contact Resistances**
Thomas Schoenemann, ABB Switzerland AG, Zürich, Switzerland; Mario Schenk, Starkstrom-Gerätebau GmbH, Regensburg, Germany; Helmut Löbl, Dresden University of Technology, Dresden, Germany; Marianne Pleines, ABB Switzerland AG, Zürich, Switzerland; Tomasz Magier, Dresden University of Technology, Germany
- 4.4 Assessment of Novel Material Concepts for High Voltage Arcing Contacts by Use of Finite Element Analysis**
A.F. Plankensteiner, R. Grill, Technology Center, Plansee AG, Austria; F.E.H. Mueller, Elektro-Metall AG, Switzerland

5:00pm - 6:00pm

Welcome Reception & Awards Presentations

Awards Presentation

Ragnar Holm Scientific Achievement Award

Prof. Koichiro Sawa

Armington Recognition Award

Phil Wingert

Dr. Morton Antler Lecture

Dr. Robert Mrockowski

2003 IEEE Erle Shobert Prize Paper

Xin Zhou, Michael Little

for

“A Novel Concept for Fault Current Tolerable Contactors”

TUESDAY, SEPTEMBER 21, 2004

8:00am - 9:15am

Morton Antler Lecture

A Perspective on Connector Reliability

Dr. Robert S. Mroczkowski, connNtext associates, Manheim, PA

9:30am - 10:30am

Communications I

Chair: J.G. Zhang

Co-Chair: Robert Malucci

5.1 Contact Impedance Characterization of Metallized Particle Column to Copper Strip in High Frequency Domains

N. Ben Jemaa, M. Himdi, A. Senouci, University of Rennes1, France; C. Koehler, Tyco Electronics, Germany

5.2 A Reliability Study to Evaluate New Compliant Designs Used In High Speed Signal Applications

Trent K. Do, Teradyne Connection Systems, Nashua, NH

5.3 Performance Parameters of a Ball Contact System between Flexprint board and PW-board for 10 Gbps Data Transfer

Achim Brenner, Horst F. Nowacki, HARTING KGaA, Espelkamp, Germany

5.4 Innovative Connector Technology Realizes Performance, Density and Manufacturing Simplicity

Stephen B. Smith, FCI USA, Inc., Eters, PA

10:30am - 10:45am

Break

10:45am - 11:45am

Communications II

Chair: Roland Timsit

Co-Chair: Stephen Cole

6.1 Tunnel Conduction Consequences in High Frequency Microcontacts; Passive Intermodulation Effect

Mihai Vladimirescu, Regina Kwiatkowski, Klaus Engel, Space Group, COM DEV Ltd., Cambridge, Ontario, Canada

6.2 High Contact Resistance Readings on Clean Microwave Mobile Contacts

Regina Kwiatkowski, Mihai Vladimirescu, Andre Zybura, Jelena Bradic, Space Group, COM DEV Ltd., Cambridge, Ontario, Canada

6.3 Switching RF Signals

Werner Johler, Tyco Electronics Axicom, Au-Waedenswil, Switzerland; Werner Rieder, University of Technology, Vienna, Austria

6.4 A Study on Transmission Characteristic of Signal Line with Solder-mount on a PCB

Hiroshi Inoue, Ken-ichi Takahashi, Akita University, Akita, Japan

11:45am - 1:15pm

Lunch on Your Own

1:15pm - 2:15pm

Materials II

Chair: J.B.P. Williamson

Co-Chair: Z.K. Chen

7.1 Electrical Conduction through Small Contact Spots

R.S. Timsit, Timron Scientific Consulting Inc., Toronto, ON, Canada

7.2 The Determination of Equivalent Constriction Resistance and Film Resistance by Using Low DC Voltages

Eisuke Takano, Consultant, Sendai, Japan

7.3 Research and Application of Testing and Analyzing System for Sealed Relay's Time Parameters

Huimin Liang, Qingsen Zhang, Guofu Zhai, Harbin Institute of Technology, Harbin, China

7.4 Stability and Contact Resistance Failure Criteria
Robert D. Malucci, RD Malucci Consulting, Naperville,
Illinois

2:15pm - 2:30pm
Break

2:30pm - 4:00pm
MEMS

Chair: Werner Johler

Co-Chair: Robert Malucci

8.1 Micro-Switches with Sputtered Au, AuPd, Au-on-AuPt, and AuPtCu Alloy Electric Contacts
R.A. Contu Jr., P.E. Kladitis, R. Cortez, R.E. Strawser,
R.L. Crane, Wright Patterson AFB, OH

8.2 A Latching MEMS Relay for DC and RF Applications
Vivek Agrawal, Memscap, Inc., RTP, NC

8.3 Development of an Electrostatically Actuated MEMS Switching Probe Card
Toshihiro Itoh, Shingo Kawamura, Tadatomo Suga,
Kenichi Kataoka, The University of Tokyo, Japan

8.4 Contact Properties of Ni Micro-Springs for MEMS Probe Card
Kenichi Kataoka, Toshihiro Itoh, Tadatomo Suga, The
University of Tokyo, Japan; Kazuo Inoue, JSR
Corporation, Saitama, Japan

8.5 Non Arcing Electric Contact Device Using the MEMS Multi Electrodes
Yu Yonezawa, Noboru Wakatsuki, Ishinomaki Senshu
University, Miyagi, Japan; Yoshio Satoh, Tadashi
Nakatani, Fujitsu Laboratories Ltd., Hyogo, Japan;
Koichiro Sawa, Keio University, Yokohama, Japan

8.6 Micro-Electro-Mechanical Relays - Design Concepts and Process Demonstrations
Han S. Lee, Delphi Research Labs., Shelby Township,
MI; Chi H. Leung, AMI DODUCO, Export, PA; Jenny
Shi, Shih-Chia Chang, Delphi Research Labs., Shelby
Township, MI

4:00pm
International Advisory Group Meeting

4:00pm - 5:15pm
TC1 Meeting

WEDNESDAY, SEPTEMBER 22, 2004

8:00am - 9:30am

Materials III

Chair: Manfred Lindmayer

Co-Chair: Brett Rickett

9.1 Effect of Fretting in Lead-Free Systems
D. Gagnon, Institut de Recherche d'Hydro-Québec,
Varenes, Canada, and École de technologie
Supérieure, Montréal (Québec), Canada; M.
Braunovic, MB Interface, Montréal, Canada

9.2 Dust Corrosion
Xue-Yan Lin, Ji-Gao Zhang, Beijing University of Posts
& Telecommunications, Beijing, China

9.3 Low Friction and Wear on Non-Lubricated Connector Contact Surfaces
James Moran, Matthew Sweetland, Tribotek, Inc.,
Burlington, MA; Nam P. Suh, Massachusetts Institute
of Technology, MA

9.4 Formation of Intermetallics in Lead-Free Systems
M. Braunovic, MB Interface, Montréal, Canada; D.
Gagnon, Institut de Recherche d'Hydro-Québec,
Varenes, Canada, and École de technologie
Supérieure, Montréal (Québec), Canada

9.5 A New Mixed Organic Layer for Enhanced Corrosion Protection of Electric Contacts
S. Noël, N. Lécaudé, LGEP, Supélec, Yvette, France;
D. Alamarguy, L. Tristani, FCI, Corporate Research
Center, Bernard, France; F. Laffineur, Z. Mekhalif, J.
Delhalle, LISE, Facultés Universitaires Notre-Dame
de la Paix, Namur, Belgium; L. Tortech, S. Géribaldi, F.
Guittard, CMOM, Université Nice-Sophia Antipolis,
Nice, France; A. Di Meo, P. Gavezotti, Solvay Solexis
S.p.A., Bollate, Italy

9.6 Electroless Ni-B and Ni-P Coatings with High-Fretting Resistance for Electrical Contact Applications
C.T. Dervos, J. Novakovic, P. Vassiliou, National
Technical University of Athens, Greece

9:30am - 9:45am
Break

9:45am - 11:00am

Automotive II

Chair: Tasuku Takagi

Co-Chair: George Drew

10.1 Contact Systems for Use in Sulfur Containing, Reformulated Gasolines

Ed Smith, Deringer-Ney, Inc., Bloomfield, CT; Hugh Ireland, Delphi-TCF, Flint, MI

10.2 Temperature, Humidity and Pressure Measurement on Automotive Connectors

Liza Lam, Christian Maul, John McBride, University of Southampton, United Kingdom

10.3 The Contact Resistance Force Relationship of an Intrinsically Conducting Polymer Interface

Liza Lam, Jonathan Swingler, John McBride, University of Southampton, United Kingdom

10.4 A Study of the Physical Characteristics of Vibration-Induced Fretting Corrosion

George T. Flowers, Fei Xie, Michael Bozack, Xin Hai, Auburn University, Alabama; Bretton I. Rickett, Robert D. Malucci, Molex, Inc., Lisle, IL

10.5 Experimental and Analytical Models of the Connector Insertion-Extraction Phase

A. El Manfalouti, N. Benjemaa, R. El Abdi, University of Rennes1, France

11:00am - 11:15am

Break

11:15am - 12:30pm

Arc Interruption II

Chair: Werner Rieder

Co-Chair: Henry Czajkowski

11.1 Contact Material and Arc Current Affect on Post-Current Zero Contact Surface Temperature

John J. Shea, Eaton Corporation, Pittsburgh, PA; Xin Zhou, Eaton Corporation, Milwaukee, WI

11.2 Temperature Rise Behind Fixed Polarity Ag-W Contacts Opening on an Half Cycle of High Current and Its Relationship to Contact Erosion

P. Borkowski, E. Walczuk, Technical University of Lodz, Poland

11.3 Experimental Investigation on Arc Motion of MCCB with Different Configurations of Arc Chamber Using Optical Fiber Measurement System

Chen Degui, Liu Hongwu, Li Zhipeng, Li Xingwen, Xi'an Jiaotong University, China; Hongtae Park, LG Industrial Systems Co., Ltd, Korea

11.4 Influence of Contact Materials on the Current Transfer Thanks to the Current Distribution Measurement in a Low-Voltage Breaking Device by Means of a Magnetic Diagnostics

D. Cajal, J.P. Toumazet, F. Gary, É. Debellut, C. Brdys, A. Laurent, Laboratoire d'Électrotechnique de Montluçon, France; C. Arnoux, L. Moreau, Schneider Electric SA, Grenoble, France

11.5 Phenomena Generated by Splitter Plates on Low Voltage Electric Arc Dynamics

Éric Debellut, Denis Cajal, Francis Gary, Alain Laurent, Laboratoire d'Électrotechnique de Montluçon, Montluçon, France

12:30pm - 2:00pm

Lunch on Your Own

2:00pm - 3:00pm

Low Current I

Chair: N. Ben Jemaa

Co-Chair: Richard Moore

12.1 Contact Welding at Break of Motor Inrush Current

Thomas J. Schoepf, Delphi Research Labs, Shelby Township, MI; Robert Rowlands, George Drew, Delphi Packard Electric Systems, Warren, OH

12.2 On the Evaluation of Low Level Contact Erosion

J.W. McBride, A.P. Sumption, J. Swingler, University of Southampton UK

12.3 Contact Welding Influenced by Anode Arc and Cathode Arc, Respectively

Werner F. Rieder, Vienna University of Technology, Vienna, Austria; Alexander R. Neuhaus, Austrian Center of Competence for Tribology, Wiener Neustadt, Austria

12.4 A Comparison of Silver Tin Indium Oxide Contact Materials using a New Model Switch that Simulates Operation of an Automotive Relay

G. Witter, Z. Chen, Chugai USA, Inc., Waukegan, IL

3:00pm - 3:15pm
Break

3:15pm - 4:30pm
Arc Interruption III
Chair: Paul Slade
Co-Chair: Xin Zhou

- 13.1 On the Arcless Commutation of Currents Higher than 1 kA**
Kaveh Niayesh, Jens Tepper, Friedrich König, ABB Switzerland Ltd., Baden - Dättwil, Switzerland
- 13.2 Micro-arcs at Make and Break Processes**
Dietrich Amft, Wolfgang Schufft, Chemnitz University of Technology, Germany
- 13.3 AC Contactor Making Speed Measuring and Theoretical Analysis**
Wenxiong Li, Hebei University of Technology, P.R. China, and Shijiazhuang Railway Institute, P.R. China; Jianguo Lu, Hui Guo, Wenhua Li, Xiuping Su, Hebei University of Technology, P.R. China
- 13.4 Increase of Lifetime of Electromagnetically Actuated Contactors by Avoiding Self Synchronization**
Gerd Griepentrog, Frank Kalvelage, Norbert Elsner, Norbert Mitlmeier, Siemens AG, Amberg, Germany
- 13.5 Contact Resistance Characteristics of High Temperature Superconducting Bulk- III**
Takuya Imaizumi, Naoki Yamamoto, Keio University, Japan; Masaru Tomita, Railway Technical Institute, Japan; Naomichi Sakai, ISTECSuperconductivity Research Laboratory, Japan; Masato Murakami, Shibaura Institute of Technology, Japan; Izumi Hirabayashi, ISTECSuperconductivity Research Laboratory, Japan; Koichiro Sawa, Keio University, Japan

5:00pm - 10:00pm
Conference Dinner at Kiana Lodge
See Page 7 for details

THURSDAY, SEPTEMBER 23, 2004

8:00am - 9:30am
Contact Phenomena II
Chair: Koichiro Sawa
Co-Chair: Bill Balme

- 14.1 Insulation Displacement Technology as Technically Equivalent and More Cost-Effective Alternative Compared to Crimping Technology**
Stefan Jörgens, Lumberg Connect GmbH&Co.KG, Germany
- 14.2 The Test Data Verifying & Prediction Model of Electrical Contact**
Wenhua Li, Kui Li, Lijun Sun, Shangwu Zhao, Lijuan Ji, Hebei University of Technology, Tianjin, P.R. China
- 14.3 The Problems of Calculation the Arc Switching Time in Tulip Contact Switches**
S.J. Kulas, Warsaw University of Technology, Poland
- 14.4 Development of Numerical Analysis Program of Laser Microscope Data**
Makoto Hasegawa, Masato Akita, Kazutaka Izumi, Chitose Institute of Science & Technology, Hokkaido, Japan; Takayoshi Kubono, Shizuoka University, Hamamatsu, Japan
- 14.5 Concerning Contact Resistance Prediction Based on Time Sequence and Distribution Character**
Fang Yao, Zhigang Li, Wenhua Li, Kui Li, Hebei University of Technology, Tianjin, P.R. China
- 14.6 Simulation of Spring System's Operation Process for Electromagnetic Relay**
Shujuan Wang, Wanbin Ren, Weiwei Fan, Harbin Institute of Technology, Harbin, China

9:30am - 9:45am
Break

9:45am - 11:00am

Low Current II

Chair: John McBride

Co-Chair: Gerald Witter

- 15.1 High Intensity Contact Opening Under DC Voltage**
T. Klonowski, R. Andlauer, T. Leblanc, Universités Paris VI et Paris XI, Yvette, France; F. Faure, Schneider Electric Industries, Grenoble, France; R. Meyer, Ph. Testé, Universités Paris VI et Paris XI, Yvette, France
- 15.2 Application of Ag-Pd-Mg New Contact Material to Micro Relays**
Terutaka Tamai, Hyogo University of Teacher Education, Yashiro, Japan; Tatsumi Ide, NEC/TOKIN IWATE Corporation, Ichinoseki, Japan
- 15.3 Relay Contacts of Multi-Electrodes with Timely Controlled Operation for Arc Discharge Suppression**
Noboru Wakatsuki, Yu Yonezawa, Ishinomaki Senshu University, Ishinomaki, Japan
- 15.4 Does an Electronic Circuit Breaker Need Electrical Contacts?**
Peter Meckler, E-T-A GmbH, Altdorf Germany; Wilson Ho, E-T-A GmbH, Seattle, WA
- 15.5 Simulation of the Heat Transfer Mechanism in Relays to Improve Contact Reliability at Freezing Temperatures**
D. Volm, R. Walesch, A. Bachmann, Matsushita Electric Works (Europe) AG, Holzkirchen, Germany

11:00am - 11:15am

Break

11:15am - 12:45pm

Materials IV

Chair: Milenko Braunovic

Co-Chair: Pat Lees

- 16.1 Thermally Induced Mechanical Degradation of Contact Spots in Aluminum Interfaces**
Christopher Ruppert, European Patent Office, den Haag, the Netherlands; Magne Runde, Norwegian University of Science and Technology, and SINTEF Energy Research, Trondheim, Norway
- 16.2 Joint Resistance Depending on Joint Force of High Current Aluminum Joints**
Stephan Schoft, Technische Universität München, Munich, Germany
- 16.3 Measurement and Calculation of the Decreasing Joint Force in High Current Aluminum Joints**
Stephan Schoft, Technische Universität München, Munich, Germany
- 16.4 Observation of Contact Bridge Phenomena at Transient and Steady State**
Hiroyuki Ishida, Yoshitomo Watanabe, Masanari Taniguchi, Tohoku Bunka Gakuen University, Sendai, Japan; Hiroshi Inoue, Akita University, Akita, Japan; Tasuku Takagi, Tohoku Bunka Gakuen University, Sendai, Japan
- 16.5 Characteristics of Carbon and Copper Flat Commutator on DC Motor for Automotive Fuel Pump**
Takashi Shigemori, Koichiro Sawa, Keio University, Yokohama, Japan
- 16.6 The Influence of Kinetic Parameters on Failure Mechanisms caused by Material Transfer**
Alexander R. Neuhaus, Thomas Felkel, Andreas Hammerschmid, AC_T research GmbH, Wiener Neustadt, Austria; Werner F. Rieder, Vienna University of Technology, Austria

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