

8th International Conference on Industrial Tribology

Theme : Tribology for Sustainable Development

7 – 9 December, 2012

The Westin Pune Koregaon Park, India

SOUVENIR



Under the Aegis of



ICIT 2012

Tribology Society of India



8th International Conference on Industrial Tribology

Technical Programme at a Glance

| 7 th December, 2012 | | 8 th December, 2012 | | | | 9 th December, 2012 | | | | | |
|--|-----|--|-----|------|------|--|------|-------|-------|-------|-------|
| Inauguration (Inspire Hall) (9.00 Hrs. to 11.00 Hrs.) | | Plenary Session II (Inspire Hall) (9.00 Hrs. to 11.00 Hrs.) | | | | Plenary Session III (Inspire Hall) (9.00 Hrs. to 10.30 Hrs.) | | | | | |
| Inauguration of Exhibition /Poster Session followed by Tea Break (11.00 Hrs. to 11.30 Hrs.) | | Tea Break (11.00 Hrs. to 11.15 Hrs.) | | | | Tea Break (10.30 Hrs. to 11.00 Hrs.) | | | | | |
| Plenary Session I (Inspire Hall) (11.30 Hrs. to 13.00 Hrs.) | | Business Meet-II (Inspire Hall) (11.15 Hrs. to 12.45 Hrs.) | | | | Technical Session-IV (11.00 Hrs. to 13.00 Hrs.) | | | | | |
| Lunch (13.00 Hrs. to 14.00 Hrs.) | | Lunch (12.45 Hrs. to 13.30 Hrs.) | | | | IV-A IV-B IV-C IV-D | | | | | |
| Business Meet-I (Inspire Hall) (14.00 Hrs. to 15.30 Hrs.) | | Technical Session-II (13.30 Hrs. to 15.30 Hrs.) | | | | Valedictory Session (Inspire Hall) (13.00 Hrs. to 14.00 Hrs.) | | | | | |
| Tea Break (15.30 Hrs. to 15.45 Hrs.) | | Tea Break (15.30 Hrs. to 15.45 Hrs.) | | | | Lunch (14.00 Hrs. Onwards) | | | | | |
| Technical Session-I (15.45 Hrs. to 17.45 Hrs.) | | Technical Session-III (15.45 Hrs. to 17.45 Hrs.) | | | | | | | | | |
| I-A | I-B | I-C | I-D | II-A | II-B | II-C | II-D | III-A | III-B | III-C | III-D |
| Cultural Program & Dinner (19.00 Hrs. Onwards) | | GBM of TSI (18.00 Hrs. Onwards) | | | | | | | | | |

(The details of programme are on the back pages 168-170)

Posters sessions : Venue: Near Exhibition area

Poster session I : 7th December 2012, 1000-1330 hrs

Poster Session II : 7th December 2012, 1400-1730 Hrs

Poster Session III : 8th December 2012, 0900 -1300 Hrs

Poster Session IV : 8th December 2012 1400-1730 Hrs

| | |
|-------|------------------------------------|
| I-A | Bearing & Gear Tribology-I |
| I-B | Automotive Tribology |
| I-C | Condition Based Maintenance System |
| I-D | Contact Mechanics & Friction |
| II-A | Bearing & Gear Tribology-II |
| II-B | Lubricants & additives-I |
| II-C | Wear Mechanisms-I |
| II-D | Tribotesting-I |
| III-A | Bearing & Gear Tribology-III |
| III-B | Surface Treatment & Coatings |
| III-C | Tribology in Manufacturing |
| III-D | Wear Mechanisms-II |
| IV-A | Lubricants & additives-II |
| IV-B | Tribotesting-II |
| IV-C | Wear Mechanisms-III |
| IV-D | Special topics in Tribology |

Message from President, TSI

Dear TSI Members,

Greetings to you all and welcome to ICIT-2012.

I am sure the organizing committee of ICIT-2012 will spare no efforts to live up to your expectations and ensure this event, both scientifically and professionally, is rewarding to each one of you.

On behalf of current TSI Executive Committee, I would like to take this opportunity to express my sincere thanks for your support and cooperation during the tenure of the outgoing executive committee, as our term ends with conclusion of ICIT-2012. The present Executive Committee assumed the office of TSI with an ambitious work plan in extending and expanding the reach of Tribology society of India in terms of its activities and dissemination of knowledge of this inter disciplinary science for the benefit of industry at large. We have kept you informed of various TSI initiatives and events over the past two years through our various communications, the TSI Website and these Newsletters. I am also happy that over past few years TSI has achieved a global orientation. Our collaborative linkages with STLE – USA are growing stronger while we are also emerging as a key player within the Asian Tribology community. I see great potential for TSI in the coming years.

We were successful in bidding and winning of the AsiaTrib-2014 conference for India amidst stiff international competition. This bears testimony of the faith reposed by Asian Tribology community in the technical and organizational prowess of TSI. Amidst this euphoria, it is imperative that each one of us at TSI had the onus of living up to the expectations of entire Asian tribology community in organizing the Asian Tribology Conference which is scheduled to be held in New Delhi during January 2014.

As we go forward, we need to involve the academia in our programs more closely and play a proactive role in promoting Tribology education at Undergraduate levels. I strongly believe that TSI can be a very important player in aligning the academic research efforts in Tribology with viable industrial solutions, for the betterment of our economy.

I would like to convey my best wishes to all of you for continued success in your professional and personal life.



Dr. R K Malhotra

President

Tribology Society of India

From the Desk of Secretary, TSI

Dear Colleagues,

As you read this, you would probably be in the midst of our biennial event ICIT-2012 at Pune. I hope all of you will find this Conference professionally enriching and very enjoyable. This is the last Newsletter to be brought out during the tenure of our current Executive Committee, which comes to an end after the Conference. It has been an exciting period of two years since the present EC took charge after ICIT-2010 at RDCIS – Ranchi. Overall this has been a mixed bag of experience for us at TSI. We achieved significant success in some of our endeavors, while more could have been done in some other areas. On the organizational front, activities at our Headquarters at IndianOil (R&D) – Faridabad have been streamlined thanks to the untiring efforts of our TSI Headquarters Team of Mr. A. K. Mehta, Mr. Ajay Kumar and Dr. Pankaj Bhatnagar. We have significantly enhanced the number of members enrolled in last two years. We have successfully obtained the registration under Sec. 12AA of the Income Tax Act in October 2011 and under Sec. 80G of the Income Tax Act in January 2012. These registrations will enable us to obtain significant benefits in the long run. The TSI website has been revamped with many new features and useful information. It is heartening to see that this Newsletter has also become a regular channel of our communication, thanks to the hard work by Dr. Har Prashad and Mr. Mehta.



The TSI Summer Schools in Tribology have now truly become National events. We have successfully organized the Summer Schools in June – 2011 and June -2012 and also succeeded in getting sponsorship support from the Department of Science & Technology, Government of India. The first National Tribology Conference (NTC-2011) of TSI was successfully organized at IIT Roorkee in December 2011. We have also made continued progress in our on-going collaboration with STLE – USA. The collaboration agreement has been renewed till 2016, which presents a great opportunity for enhanced interactions between the two Societies. The first TSI – STLE Certification Training and Examination was conducted at IIPM, Gurgaon in April, 2012. Though there were logistic problems faced with shipping of the examination papers to the US leading to a re-examination, the response to this event has been very encouraging and we hope to make this an annual event. The TSI Team actively participated in the 67th STLE Annual Meeting at St. Luis, Missouri in May 2012.

Let us also focus on some areas that need our urgent attention. We are making serious efforts in regularizing the publication of our Indian Journal of Tribology, and hopefully it will soon evolve into a publication of international standards. Our Local Chapters need to enhance their levels of activity in respective locations. We also need to boost our Industry interactions, so that the Indian Industry can reap full benefits from sound Tribological practices. Establishing Tribology curricula in engineering colleges and bringing out affordable Tribology text books for Indian students should also be our priority in coming years.

I would like to remind you of one more mega event of TSI, the prestigious ASIATRIB-2014 at New Delhi, which is being planned during early 2014. This will be a landmark event in the history of TSI and will make our Society a truly global player. I invite all of you to come forward and join hands with other TSI Members to realize our dreams about TSI.

I take this opportunity to convey my greetings to you and your family for a very enjoyable winter vacation and an exciting New Year 2013.

With best wishes,

Dr. Barun Chakrabarti
Secretary
Tribology Society of India

"Welcome to ICIT 2012"

TSI has been conducting biennial international conferences on Industrial Tribology for the past decade and half and the 8th edition of this conference is going to unfold in Hotel Westin, Pune from Dec.7th-9th, 2012. The theme of this conference is "Tribology for Sustainable Development".



Over the years, this international conference has gained popularity as an important scientific event in the area of Tribology, which is very relevant for all automotive and industrial segments. Practicing engineers, lubrication specialists, end users, researchers from all over the world from these industrial segments, academia and research institutes will participate in this conference to exchange knowledge about new developments in this area of science and technology. Prior to the conference (on Dec.6th) we have two education courses on "Basics of Tribology" and "Automotive Tribology", where eminent faculty drawn from industry and academia will give presentations. These courses are especially helpful to students, researchers and young and budding engineers/lubrication executives from various industrial segments to get requisite understanding about the principles of tribology and lubrication.

8th ICIT has attracted an overwhelming response of more than 200 technical paper proposals from all over the World. Eminent specialist Tribologists from General Motors, STLE, USA and SWRI, USA, Esslingen, Germany etc. are going to present their research findings in this conference. Apart from these, there is an overwhelming response from academia of India and abroad. This conference will also comprise of a concurrent exposition of various instrument manufacturers in the field of Tribology and lubrication, showcasing their latest instruments.

Pune city in December offers very pleasant weather and right kind of historic backdrop for the conference.

As Organizing Secretary of this conference, I would like to invite industrial and academic community from India and abroad and especially the TSI member community for having a technically enriching conference, which is intended to keep you abreast of the latest developments in the field of Tribology.

Dr.SSV Ramakumar
*EC Member, TSI &
Organizing Secretary ICIT-12*

Tribology Society of India - Initiatives & Activities

Tribology is a multi-disciplinary subject dealing with the study of interacting surfaces in relative motion. The term, derived from the Greek word "Tribos" (meaning "Rubbing"), in general denotes the subject of Friction, Lubrication & Wear technology. Over the years, the subject of Tribology came to be recognized as a very important aspect in all industrial operations. The application of correct Tribological practices can protect and enhance the life of plants and machinery, improves efficiency of operations, reduce energy consumption and prevent expensive breakdowns. Major organizations and academic institutions in the country have realized the importance of Industrial Tribology and its relevance to modern design and efficient plant maintenance.



The activities related to Tribology in the country started way back in 1972, when First International Conference on Tribology was organized by Indian Institute of Technology at New Delhi. Continuing with this, a series of National and International Conferences had been organized in the last 29 years. Besides there are a number of academic and industrial centers in India actively pursuing research activities in this area.

To provide a common umbrella to work further in this area, Tribology Society of India (TSI) was set up as a professional, non-profit body bringing together academicians, industry as well as research organizations as its members. The Society is affiliated to the International Tribology Council (ITC) based in London, UK along with 36 other National Tribology Societies spread all over the world. Currently the Society operates from its registered office at IndianOil R&D Centre, Faridabad.

TSI is committed to provide a common forum for technologists, scientists and industrialists to meet and to foster the advancement of Tribo-science through its various activities. Though it organizes conferences, seminars and workshops at various locations on a periodic basis, a need was felt for further fostering of such activities on a more active and regular basis through the formation of the local chapters of the society. As India is a large country, and the local needs vary from region to region, it was perceived that local chapters can effectively address their requirements and further strengthen the national level efforts of the society. To meet these need local chapters were created at seven locations in India.

Since its inception, the TSI has emerged as the premier professional body in India in the field of Tribology. Over the past two decades, TSI has provided the right platform to engineers, scientists, academicians and students for promoting Tribology awareness, education, training and research.

In keeping with its mandate of promoting Tribology awareness and practice in India, TSI has been organizing conferences and education courses. So far 11 National Conferences (NCIT) and 7 International Conferences (ICIT) have been organized across India, on relevant themes. The ICITs are organized once every two years. Starting with 2011, TSI is also launching an annual National Tribology Conference (NTC). The first such event (NTC-2011) was organized at the Indian Institute of Technology, Roorkee during 8 - 10 December 2011. TSI has been constantly striving to make these Conferences professionally beneficial for the participants. The ever increasing number of participants, sizeable number of foreign delegates,

exhibition stalls and new initiatives such as Business Meets bear testimony to the fact that the TSI Conferences are now recognized as important events for the international Tribology community.

TSI has also been active in providing excellent networking opportunities for its members, through its local chapters spread across the country. TSI members can have access to the collective expertise and experience of other members, domain specialists and Tribologists of global repute. The Society publishes the Indian Journal of Tribology (IJT) and also brings out TSI Newsletters for its member community. The TSI Journal not only serves as a useful source of current technical knowledge, but also provides a forum to Tribology professionals for sharing their own work and learning. Starting in 2010, TSI has instituted the "TSI Lifetime Achievement Award" to honour distinguished Indian Tribologists. Plans are being finalized to introduce "TSI Tribologist of the Year" award soon.

In keeping with its focus on Tribology education, TSI has been successfully organizing TSI Summers Schools for past four years, for participants from academia and industry. This has become a very popular annual event in the country, which has also received support from Department of Science & Technology (DST), Government of India.

As part of its focus on international collaboration, TSI entered into a collaboration agreement with the Society of Tribology and Lubrication Engineers (STLE) in 2009. Two highly successful TSI - STLE Tribology Education Courses have been conducted in India in 2010 and 2011, with the help of distinguished faculty from STLE - USA. This is also going to be an annual Tribology event in India. TSI Members are also eligible to receive several benefits that are available to the STLE Members in the USA.

TSI has been playing an important role in the Asian Tribology Council (ATC) formed by the National Tribology Societies of key Asia-Pacific countries. TSI was also instrumental in developing the draft Constitution for the ATC. TSI has been participating in the ASIATRIB Conferences of ATC, which is organized once in four years. It is a matter of pride for India that TSI has been entrusted with the responsibility of organizing the ASIATRIB-2014 event in India in 2014. This will become a landmark event in the history of Tribology in India.

TSI is now poised for an impressive growth, with a series of new initiatives that have been launched during past few years and several others that are being planned. These include:

- Professional training and certification courses in collaboration with STLE, USA
- Establishment of domain-specific Technical Committees and Industry Councils
- Launching of TSI consulting services
- Industry-focused Tribology surveys and performance-improvement programs
- Collaborative research programs
- Formulation of UG and PG curricula in Tribology for engineering colleges

All these initiatives will enable TSI to achieve its Aims and Objectives and to offer its members long-term professional benefits.

Please visit www.tribologyindia.org for more information.

A. K. Mehta
Executive Director
Tribology Society of India



Tribology Society of India

Headquartered at Indian Oil Corporation Limited

Research & Development Centre

Sector-13, Faridabad-121007, Haryana, India.

Email : info@tribologyindia.org

Website : www.tribologyindia.org

**Glimpses of Past
Tribology Conferences in
India**

Tribology Conferences in India

| S. No. | Dates | Title | Organised by |
|--------|---------------------|---|------------------------------|
| 1 | 11-18 Dec., 1972 | First WCIT, New Delhi | Indian Inst of Tech., Delhi |
| 2 | 18-21 Dec., 1974 | First National Conference | Indian Inst of Tech., Madras |
| 3 | 6-8 Dec., 1976 | 2nd National Ind Trib Conf 1976 | Indian Inst of Tech., Bombay |
| 4 | Oct-79 | Proceedings NCIT 1979 | Ind Inst of Pet. Dehra Dun |
| 5 | 7-8 Sep., 1981 | NCIT, 7-8 Sep., 1981, Proceedings | IOC R&D Faridabad |
| 6 | 19-20 Jul., 1984 | NCIT, 19-20 July 1984 | BHEL, Corp R&D Hydrabad |
| 7 | 11-12 Dec., 1986 | NCIT 1986 | IOC (M) & Lubrizol |
| 8 | Dec., 1989 | VIII NCIT-1989 | VSSC, Trivendram |
| 9 | 7-8 Feb., 1991 | IX NCIT, 1991 | CMTI, Bangalore |
| 10 | 24-26 Mar., 1993 | X NCIT, 1993 (Recent Adv in Trib Vol I & II) | Ind Inst of Pet. Dehra Dun |
| 11 | 22-25 Jan. 1995 | XI NCIT, 1995 | IOC R&D Faridabad |
| 12 | 2-5 Dec., 1997 | Proceedings of ICIT, 2-5 Dec, 1997, Calcutta | Balmer Lawrie & BL-Fuchs |
| 13 | 1-4 Dec., 1999 | II ICIT-1999 (Trib in 2000 and Beyond) | BHEL, Corp R&D hydrabad |
| 14 | 8-11 Apr, 2012 | ICIT-01 (Emerging Trends in Tribology) | Tata Steel, Jamshedpur |
| 15 | 15-18, Dec., 2004 | ICIT-2004 (Trib for Equpt Reliability) | IOC,BPC,HPC and L&T, Mumbai |
| 16 | Nov 30-Dec 02, 2006 | ICIT-2006 | IISc., Bangalore |
| 17 | 6-8,Nov., 2008 | 6th ICIT-08, Trib for Energy Eff & Env Protection | IOC R&D Faridabad |
| 18 | 2-4 Dec, 2010 | 7th ICIT 2010 | RDCIS, Ranchi |

**PROCEEDINGS
OF THE
FIRST WORLD CONFERENCE
IN
INDUSTRIAL TRIBOLOGY
NEW DELHI : 1972**

Dedicated to all those, both in India and abroad, who directly and indirectly rendered their support in the noble cause in successfully organising the First World Conference in Industrial Tribology, 1972 in New Delhi

Acc. No. 805

LIBRARY,

Industrial Research And Development Centre

Edited by

Dr R. C. MALHOTRA
Head & Professor of Applied Mechanics Department
Indian Institute of Technology,
New Delhi-110029, India

and

Dr. J. P. SHARMA
Head of Tribology Laboratory & Asst. Professor
Mechanical Engineering Department
Indian Institute of Technology,
New Delhi-110029, India

World International Conference on Industrial Tribology, New Delhi 1972



**I
N
D
U
S
T
R
I
A
L

T
R
I
B
O
L
O
G
Y**

**FIRST
NATIONAL CONFERENCE**

December 1974

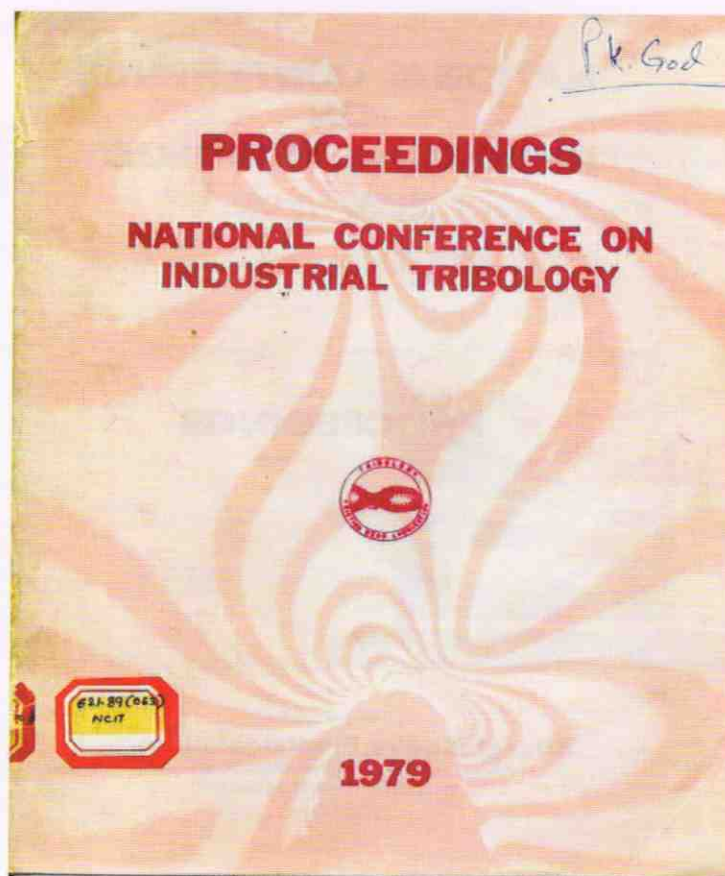
MADRAS

Sponsored by
Indian Society for Industrial Tribology
Indian Oil Corporation Ltd.
National Productivity Council
Lubrirol (India) Ltd.
and
Indian Institute of Technology, Madras

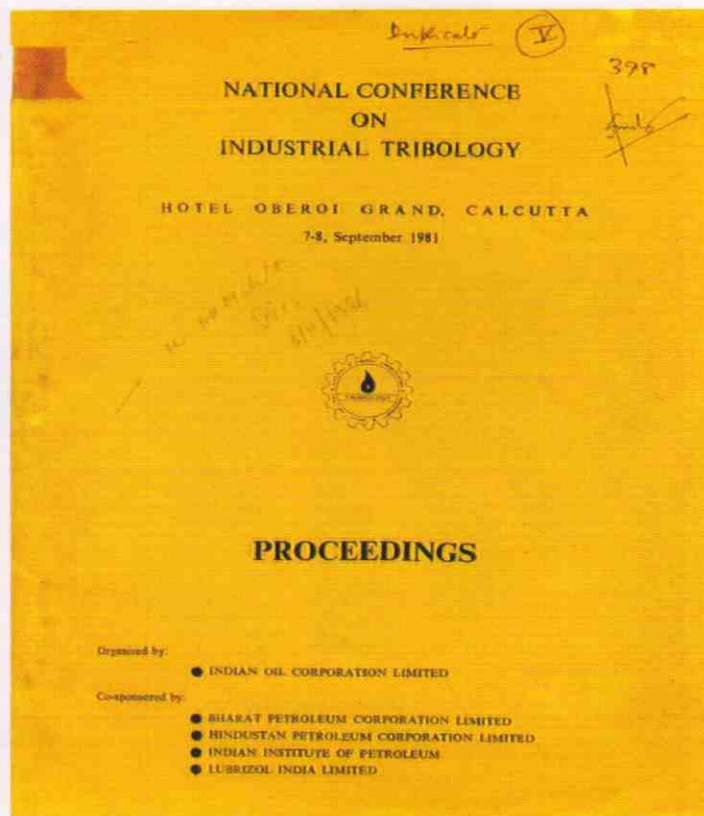
1st National Conference on Industrial Tribology 1974, IIT Madras



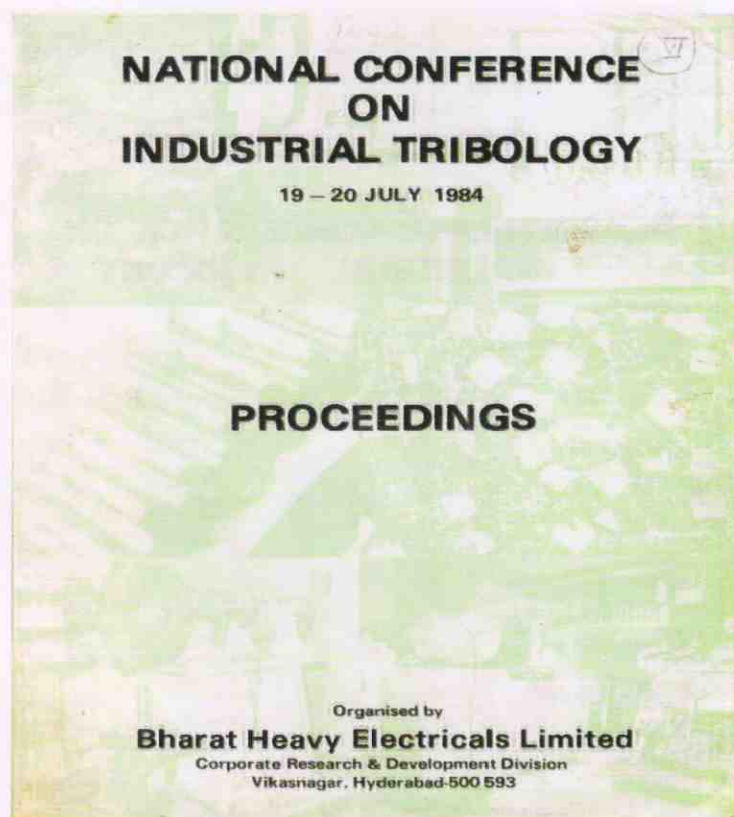
2nd National Industrial Tribology Conference, IIT Bombay 1976



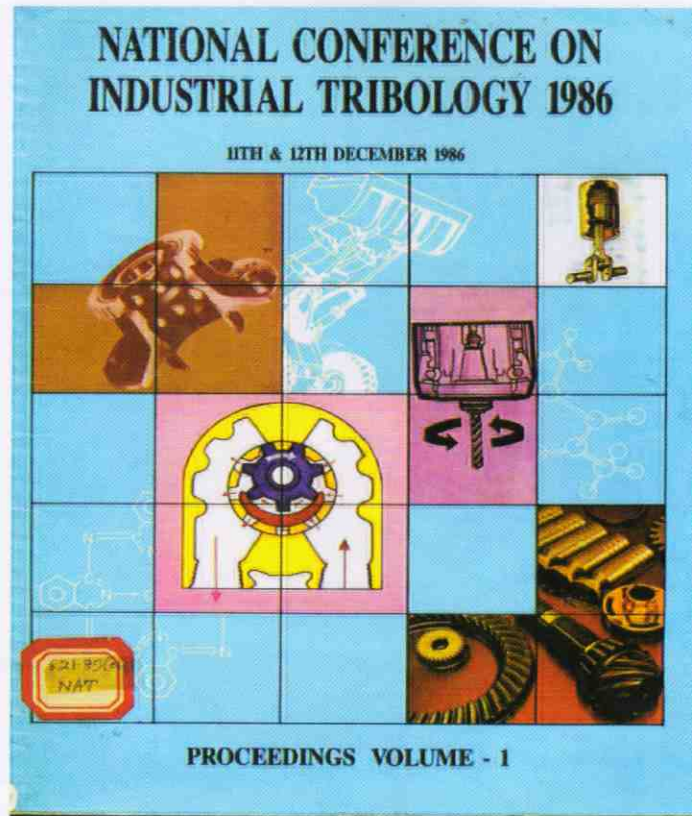
3rd National Conference on Industrial Tribology, IIP Dehradun, 1979



4th National Conference on Industrial Tribology, Calcutta, 1981



5th National Conference on Industrial Tribology, Hyderabad 1984



6th National Conference on Industrial Tribology, Mumbai, 1986



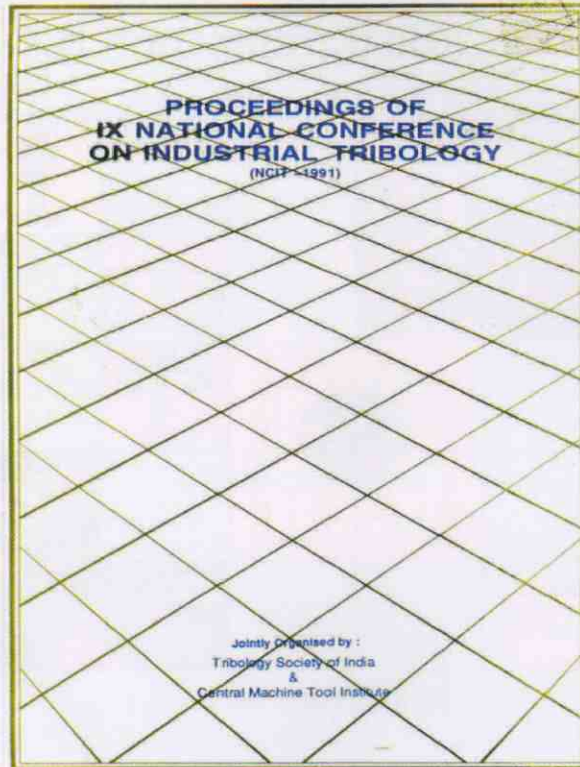
7th National Conference on Industrial Tribology, 1989, Trivandrum

Organised by
 Vikram Sarabhai Space Centre,
 Indian Space Research Organisation,
 Trivandrum, India

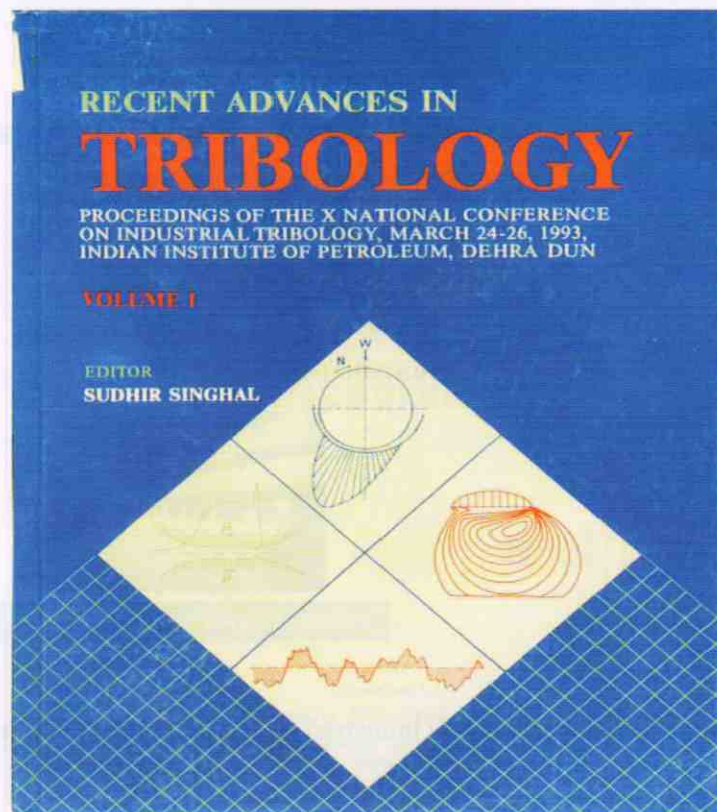


VIKRAM SARABHAI SPACE CENTRE, TRIVANDRUM

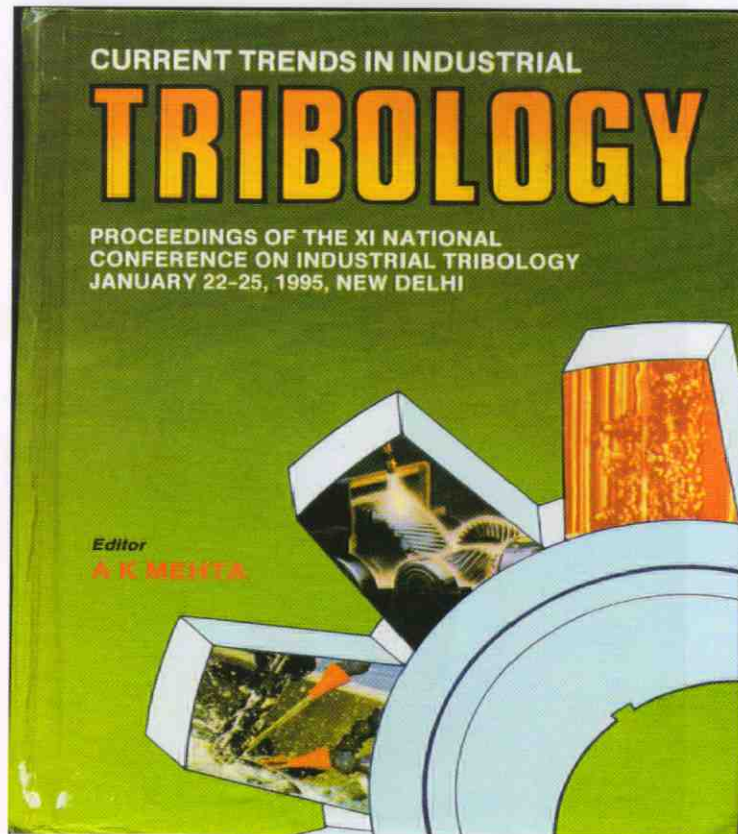
7th National Conference on Industrial Tribology, 1989, Trivandrum



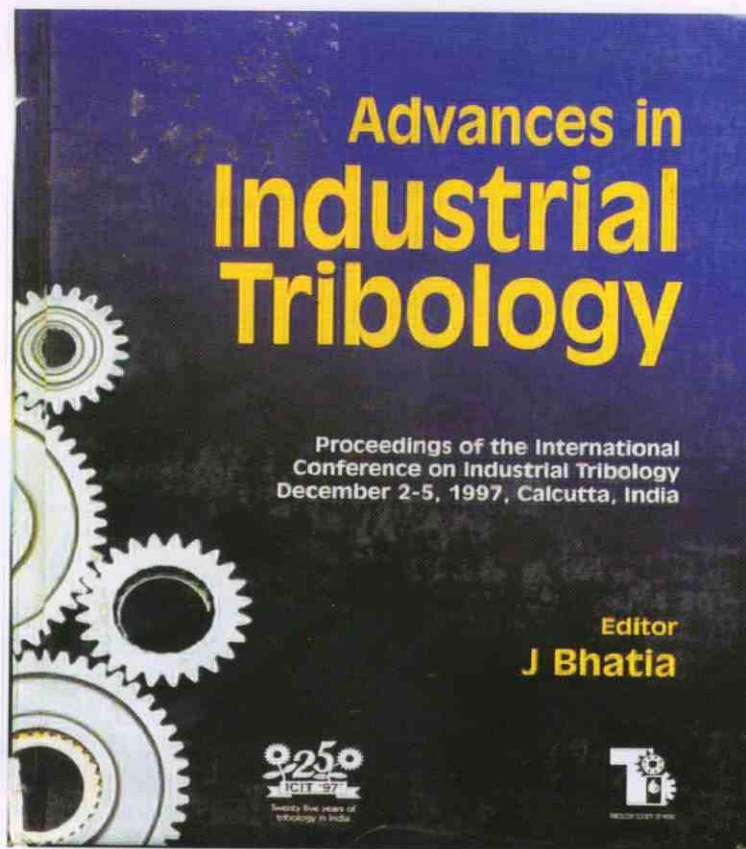
IX National Conference on Industrial Tribology, Bangalore, 1991



Xth National Conference on Industrial Tribology, Dehradun 1993



XI National Conference on Industrial Tribology, New Delhi, 1995

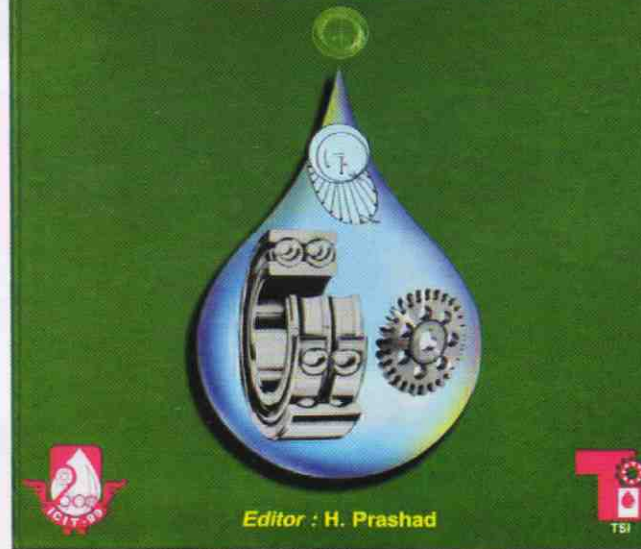


1st International Conference on Industrial Tribology, Calcutta, 1997

TRIBOLOGY IN 2000 AND BEYOND

Proceedings of the Second International
Conference on Industrial Tribology

December 1-4, 1999 Hyderabad, India



2nd International Conference on Industrial Tribology, Hyderabad 1999

EMERGING TRENDS IN TRIBOLOGY

ICIT '01

APRIL 8 - 11, 2002

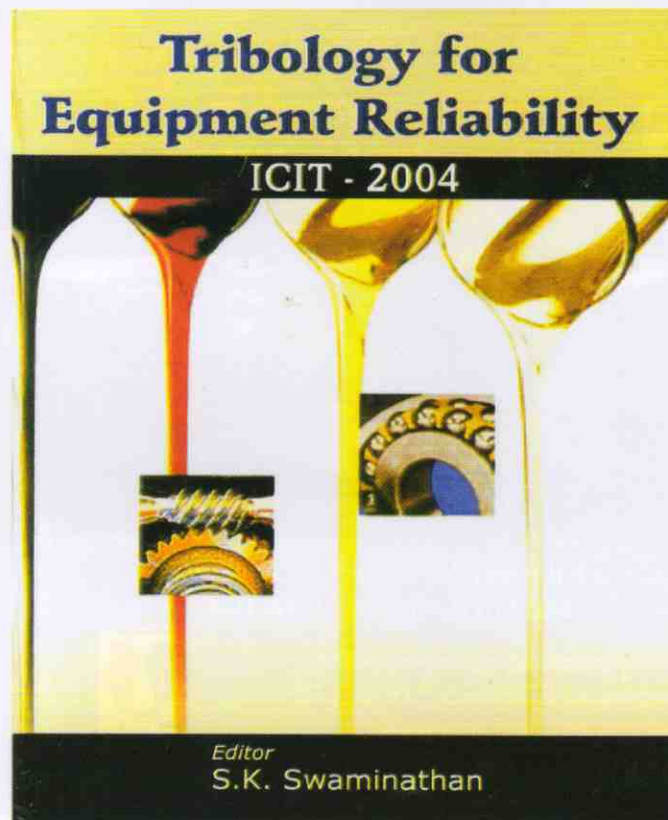
JAMSHEDPUR, INDIA

*Proceedings of the
Third International Conference
on Industrial Tribology*

Edited by C. Mishra



3rd International Conference on Industrial Tribology,
Jamshedpur, 2002



4th International Conference on Industrial Tribology, Mumbai, 2004



5th International Conference on Industrial Tribology, IISC, Bangalore, 2006

6th
International Conference on Industrial Tribology - 2008
 ICIT - 08

R&D
 Research & Development

Tribology for Energy Efficiency and Environment Protection

SCOPE Convention Centre, New Delhi

November 6 - 8, 2008

F+L
 ASIA

Conference Proceedings

6th Industrial Conference on Industrial Tribology, New Delhi 2008

Final Announcement
7th International Conference on Industrial Tribology
Theme Tribology for Steel & Mining Industries
 December 2-4, 2010
 Venue : Ispat Bhawan, SAIL, Ranchi, India

Organised by
 R & D Centre for Iron and Steel SAIL, Ranchi

In Association with
 Centre for Engineering & Technology SAIL, Ranchi

Under the aegis of
 Tribology Society of India

Central Coalfields Limited Ranchi

Sponsors
 Platinum: SAIL, IITR
 Gold: IITR
 Silver: HP, Bharat Petroleum, LUBRIZOL

Co-Sponsors: VATA, VAAV STEEL, Raj Group
 Media Partner: STEEL & METALLURGY

7th International Conference on Industrial Tribology, Ranchi 2010

8th International Conference on Industrial Tribology (ICIT - 2012)

SPONSORS

Platinum



Gold



Silver



The smart approach to metalworking additives



Proven effective across a broad range of fluid chemistries, Afton introduces the smart approach to metalworking additives in the form of **Polartech® Amide MA™ 300**. This multifunctional additive is secondary amine free, exhibits excellent pH buffering capacity, offers low odour properties, corrosion inhibition and outstanding emulsification and lubricity enhancement all within a single product.

Polartech® Amide MA™ 300. The smart multifunctional additive.

www.aftonchemical.com

© 2012, Afton Chemical Corporation is a wholly owned subsidiary of NewMarket Corporation (NYSE:NEU) www.aftonchemical.com

 **Afton**
CHEMICAL
Passion for Solutions™

TSI ACTIVITIES IN THE



RECENT PAST



FRICTION IS NOW PART OF FICTION.



Across industries, machines are running smoother leading to reduced energy costs, reduced wear and tear, improved energy efficiency, increased longevity of machines, reduced downtime, reduced cost of repairs and increased profits. Sounds impossible... **MAK** makes it possible.

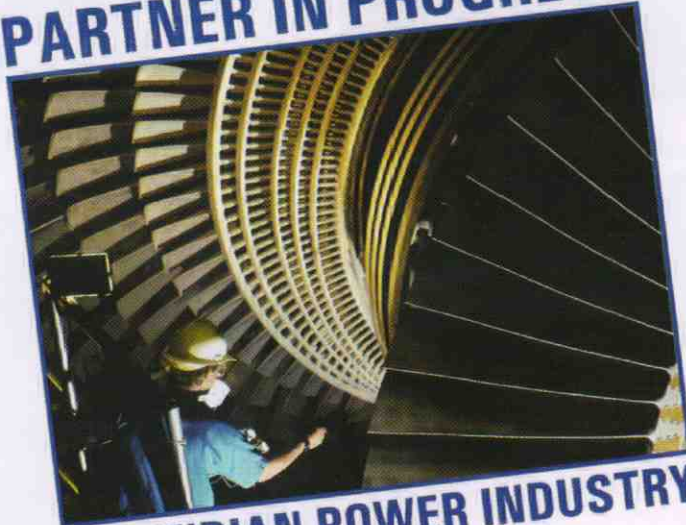
MAK *sim*imize your success. Visit www.maklubricants.com Or Call 022-22713792





HP TURBINOLS

PARTNER IN PROGRESS



FOR INDIAN POWER INDUSTRY

HP Turbinol Grades have partnered the Indian power generation industry for energising the nation. Consistent performance, impeccable quality and hassle free operations make them a popular choice across all categories. They are premium quality turbine oils made from Group II Base Stocks having excellent oxidation and chemical stability.

These properties are further enhanced with incorporation of carefully selected antioxidants, rust inhibitors and anti foam agents.

Excellent demulsibility and quick release of entrained air make it a long service oil. These turbine oils ensure flawless operations and coupled with team of skilled HP Technical Service Engineers surely make it a revolution that will last for the years to come.

Think Turbine Oils, Think HP TURBINOLS

Single-point Solutions for the Hydrocarbon Sector



A US\$ 12.8-billion technology, engineering, construction and manufacturing conglomerate, L&T operates worldwide. For the hydrocarbon sector, L&T designs, engineers and executes world-class projects with single-point responsibility.

L&T's capability spectrum spans the entire range of offerings: front-end design, detailed engineering, modular fabrication, procurement, project management, construction, installation and commissioning. Proven competencies, offshore installation capabilities, world-class fabrication facilities and strategic alliances with world leaders enable L&T to deliver projects conforming to stringent quality benchmarks, international HSE standards and challenging time schedules.

Offerings include:

- EPCI solutions for offshore platforms for oil & gas production, processing and transportation, drilling jack-ups & semi- submersibles, Floating Production Storage & Offloading (FPSOs) and other deepwater floating and subsea systems
- EPCC of Refinery, Petrochemical, Chemical, Fertilizer, Onshore Gas Processing projects and Unit Systems & Modular Process Plants
- Hydrocarbon plant construction and cross-country pipelines & terminals, on turnkey basis





Helping the World Run a Little Smoother

Lubrizol is helping companies worldwide as a grease additive technology partner. In today's complex marketplace, you need a company that understands the demands of ever-changing applications, environmental concerns, LEAN manufacturing and worldwide standards and protocols.

Lubrizol is at the forefront of industry advancements offering our customers superior functionality, product consistency, R&D and testing. We are improving grease performance and processes worldwide. To learn more visit www.lubrizol.com.

With you every step of the way.

Lubrizol

www.lubrizol.com

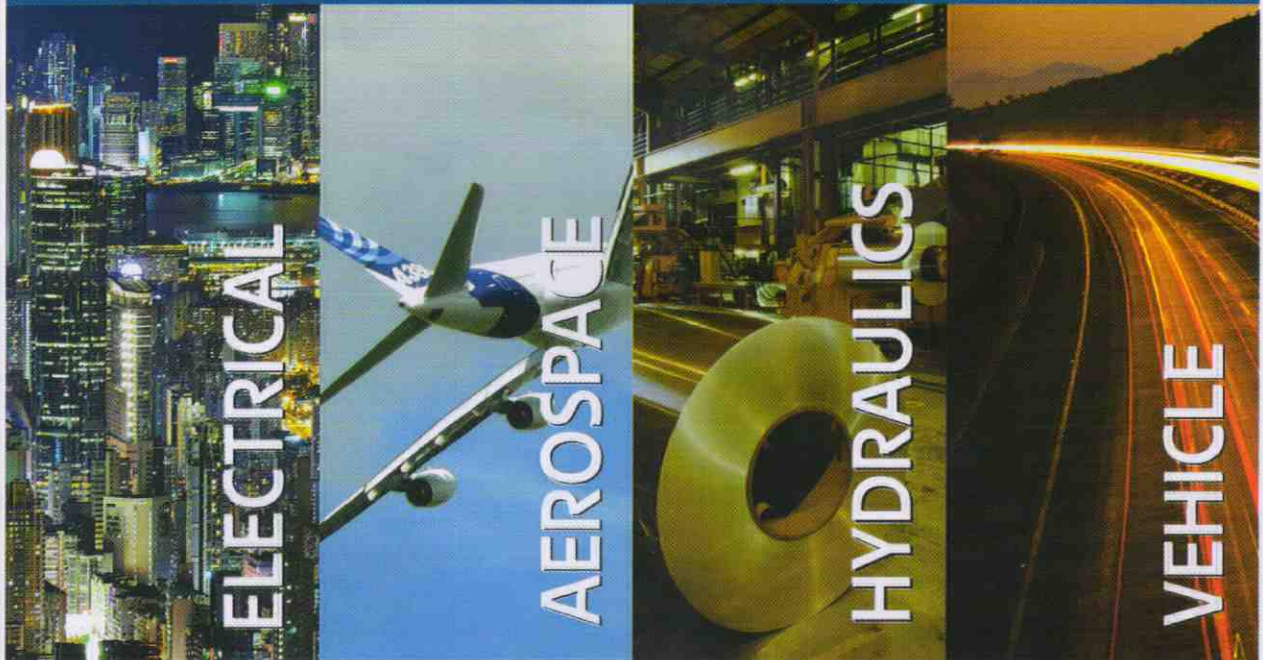
© 2012 The Lubrizol Corporation. All rights reserved.
111266



Powering Business Worldwide

Eaton Corporation is a diversified power management company with more than 100 years of experience providing energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power. With 2011 sales of \$16.0 billion, Eaton is a global technology leader in electrical components and systems for power quality, distribution and control; hydraulics components, systems and services for industrial and mobile equipment; aerospace fuel, hydraulics and pneumatic systems for commercial and military use; and truck and automotive drivetrain and powertrain systems for performance, fuel economy and safety. Eaton has approximately 73,000 employees and sells products to customers in more than 150 countries. For more information, visit www.eaton.com.

Eaton's Integrated Power Management Solutions





**World class bearings
for a world
constantly
on the move.**



For the last 60 years, NBC has been the invisible force, putting industries on the go. Today, armed with the strengths to go global, we reaffirm our focus: to develop a world-class R&D system, to listen to you—our customers—constantly, and to invent 'flexible solutions' that keep things moving.



Our promise: Listening to customers, anticipating their needs • Improved product design
• Innovation through product development • Meeting delivery dates and schedules

www.nbcbearings.com

You'll find our world-class range in:



2 WHEELERS



3 WHEELERS



4 WHEELERS



TRACTORS



LCV, HCV



INDUSTRIES



RAILWAYS

National Engineering Industries Ltd., Khatipura Road, Jaipur - 302 006

National Engineering Industries Limited is a part of the CK Birla Group which is a \$2 billion conglomerate with presence in Cement, Consumer Electricals, Precision Bearings, Heavy Engineering Products, Paper, Building Products, Automobiles, Auto Components, Healthcare, Education & ITES.



WHY ARE WE CONCERNED ABOUT THIS TEENAGER'S AIM?

Because Deepika Kumari is a Commonwealth Games gold winner and a cadet of the Tata Archery Academy.

Because, when we unearth talent, we nurture it without considering caste or creed.

Because we believe that anyone can soar to great heights with the right focus.

Because, in our eyes, everyone who has the desire to succeed, should be enabled to do so.

Because we've been nurturing tomorrow's top athletes for over a hundred years.

Because her success is inextricably linked to our success as a nation.

Because it's not just a company policy, it's an unwavering belief.

Because, each time she raises her bow, our commitment deepens.

Because however strong our steel may be, our values remain stronger.

TATA STEEL
Values stronger than steel



Deepika Kumari
Cadet, Tata Archery Academy

Join us at  Follow us on  | www.tatasteelindia.com | www.valueabled.com

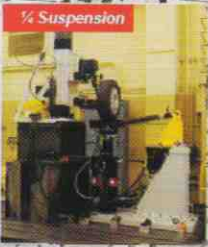
ADVERTISERS

empowering technology



TRANSDUCERS

- Accelerometers
- Force Sensors
- Microphones
- Pressure sensors
- Impulse Hammer Kit
- Microflows
- Signal conditioners
- All related cables



DATA ACQUISITION

- Portable FFT Analysers
- Multichannel Data Acquisition
- Static and Dynamic Testing
- High Speed Data Acquisition
- High Voltage DSO

EXPERIMENTAL ANALYSIS SOFTWARE'S

- General Noise and Vibration
- Modal Testing
- Acoustic Analysis
- Sound Quality
- Sound Source Localisation
- Sound Path Contribution
- Order Analysis
- STL Analysis



Testing Facilities

- NVH Test Setup
- Anechoic Rooms
- Reverberation Rooms
- Acoustic Enclosures

Testing Systems

- Vibration Test Systems
- Vibration Controllers

Transducer Calibration System



TOTAL TESTING SOLUTION FOR ENVIRONMENTAL SIMULATION

NVH & DURABILITY SOLUTIONS

- We also provide the following services:*
- ▶ On-site Noise & Vibration Measurement and Analysis.
 - ▶ On-site or off-site Experimental Modal Testing and Operational Modal Testing.
 - ▶ Acoustic Testing and Analysis, Noise Source Identification.
 - ▶ Vibration (Qualification / Environment) Tests.
 - ▶ Modifications / Solutions to Noise and Vibration Problems.
 - ▶ Calibration of Vibration Sensors.
 - ▶ Leasing of Hardware and Sensors.



ADAMS TECHNOLOGIES PRIVATE LTD

27, (Old No. 16), Lakshmanan street, Mahalingapuram, Chennai - 600 034. INDIA
Tel : +91 44 2817 3711 / 4206 8668 / 2817 1631, Fax : +91 44 2817 2676

Branches - Bangalore Pune New Delhi

www.adams-tech.net
e-mail: sales@adams-tech.net

Croda Lubricants

Leading the way naturally



Croda - a leading global supplier of high performance base fluids and additives

Croda Lubricants responsibly manufactures high quality products using unique multiple technology platforms. Proven strengths include:

- Ester technology, including multi-functional esters (Priolube™)
- Self-emulsifying esters combining lubrication and emulsification in a single molecule
- Polyalkylene glycols (Emkarox™)
- Amides (Crodamide™)
- Polymeric emulsifiers (Hypermer™)
- Alkoxyfates (Synperonic™)
- Speciality effect additives (Perfad™, Crodacor™, Kemelix™, Crodafos™, Crodasinic™ and Crodazoline™)
- Fatty Acids (Pripol™, Prisorine™, Priolene™, Pritac™ and Prifrac™)

Croda's products can be used as base fluids, corrosion inhibitors, lubricity additives, emulsifiers, friction modifiers, dispersants, demulsifiers, anti foaming agents and more.

Croda India offers a global range of products including some locally produced esters and emulsifiers.

For more information about any of our Croda Lubricants products, please email us at Shantanu.das@croda.com or visit www.crodalubricants.com.

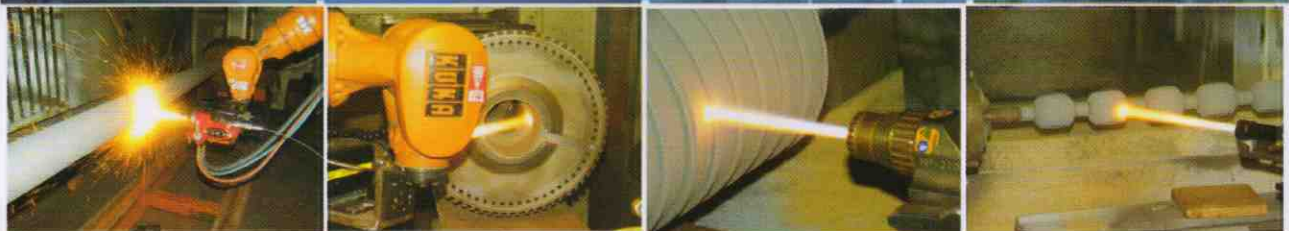
Croda India Sales Office
Tel: + 91 22 3094 8400/500/600

www.crodalubricants.com

CRODA
Lubricants



THERMAL SPRAY



Metallizing Equipment Co. Pvt. Ltd.

Apply thin coating of metals, ceramics, cermets and carbides by Thermal Spraying (plasma, arc, hvof, gas flame) process for sustainable protection against industrial wears.

Complete solution provider since 1967

www.mecpl.com

HOME

FAQ

APPLICATIONS

PRODUCTS

APPROVALS

R & D

TRAINING

CLIENTS

SITE MAP



EHD (Elasto Hydrodynamic Lubrication)

The EHL Ultra Thin Film Measurement System is a computer controlled instrument for measuring the film thickness and traction coefficient (friction coefficient) of lubricants in the elasto-hydrodynamic lubricating regime.



USV (Ultra Shear Viscometer)

The USV is a computer controlled instrument capable of fully automatic viscosity measurements at 10^7 s^{-1} .



MTM (Mini Traction Machine)

The MTM2 is a flexible general purpose instrument for measuring the frictional properties of lubricated and unlubricated contacts under a wide range of rolling and sliding conditions.



HFRR (High Frequency Reciprocating Rig)

The HFRR is a microprocessor-controlled reciprocating friction and wear test system which provides a fast, repeatable assessment of measuring the lubricity of low-sulphur diesel fuel as specified in CEC, ASTM, ISO, and JIS test methods.



MPR (Pitting/Micro Pitting Rig)

The MPR is a computer controlled three-contact disc machine in which there are three 'counterface' rings of equal diameter positioned apart with a smaller diameter roller located in the middle and in contact with all the rings. This arrangement allows the test roller to be subjected to a large number of rolling contact cycles in a short period of time and hence significantly reduces testing time. At a typical entrainment speed of 3.5m/s, the central test roller will experience approximately one million contact cycles per hour.

Leaders in Tribology Test Equipment

pcs-instruments.com

Precision Alloys & Chemicals

With Best Compliments

- 1) All India Distributors for Metarc & MG Series of Specialised Maintenance Welding Electrodes
- 2) Specialised Welding Repair & Reclamation Services.

Address: N-165, Lado Sarai, New Delhi – 110 030

Tel. No: 011-29523595/693

Fax No: 011-29522093

Email: weld.pac@vsnl.com



ALLIANCE TECKNOLOGIES

**EXCLUSIVE BUSINESS PARTNERS
IN INDIA FOR
STANHOPE-SETA LIMITED, UK**



Stanhope Seta.
Winners of The Queen's Award for Enterprise 2012
For International Trade
Honouring 75 years of British excellence in the Global Fuels Industry



**C.A. NATRAJAN - BUSINESS DIRECTOR
ALLIANCE TECKNOLOGIES**

info@alliancetechnologies.net

**www.alliancetechnologies.com
www.stanhope-seta.co.uk**

SIDDHARTH PETRO PRODUCTS

A MANUFACTURING FACILITY THAT STARTED WITH AN IDEA...



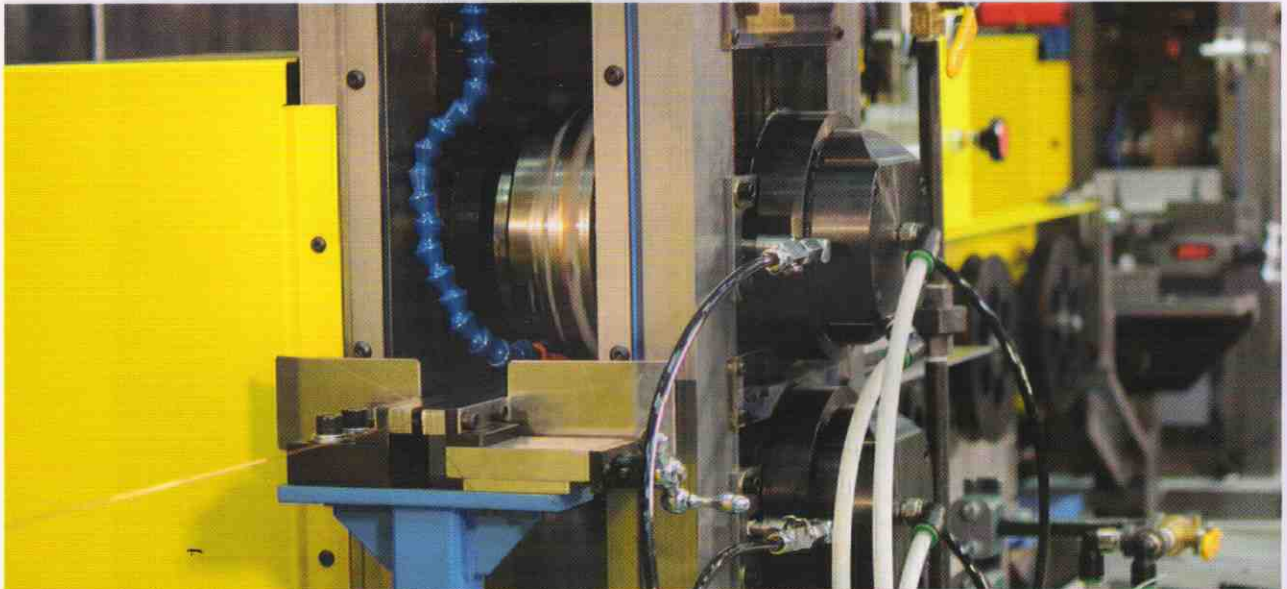
An idea to ensure it is unique. An idea to ensure it thinks for you. An idea to ensure quality with economy. Vertically integrated departments, hi-tech machineries, state-of-the-art testing facilities, spic & span environs, sophisticated R&D centre are just an expansion of this idea. All these efforts have helped us to become the most favored private label maker for the best brands across the globe. Come, experience for yourself an idea that's ideal for you!

- MULTIPURPOSE GREASES
- EP & LI-COMPLEX GREASES
- MOLY GREASES
- FOOD GRADE GREASES
- SPECIALTY GREASES
- SYNTHETIC GREASES
- AUTOMOTIVE LUBRICANTS
- INDUSTRIAL LUBRICANTS
- SPECIALTY LUBRICANTS
- SYNTHETIC LUBRICANTS
- METAL WORKING FLUIDS
- TRANSFORMER OILS



An ISO 9001, ISO 140001 and OHSAS18001 certified enterprise.

SPX



MACHINES THAT **GROW** YOUR BUSINESS.



Renewable Energy



Materials Research



Aerospace



Oil & Water Well Screens



Agriculture



Military



Automotive



Superconducting Technology



Medical

IN INDIA CONTACT:
Sourcesmart - Namdeo Ranjane
206 Stanford Plaza
B65 New Link Road
Andheri (W), Mumbai 400053
TEL 22-2673-4850
FAX 22-2673-4851
E-MAIL: sourcesmart@gmail.com

SPX PRECISION COMPONENTS
300 FENN ROAD
NEWINGTON, CT 06111
TEL 1.860.594.4300
FAX 1.860.667.4667
www.spxfenn.com

SPX is a Fortune 500, multi-industry manufacturing leader. The Fenn Division of SPX Precision Components is a global supplier of high quality metal forming equipment for over a century. Our experts work with a wide variety of industries to create custom metal forming and shaping equipment to their desired specifications. Fenn Division is located in Newington, Connecticut, USA.

- › Rolling Mills
- › Wire Flattening and Shaping
- › Drawbenches
- › Spring Coilers
- › Turks Heads
- › Swagers
- › Lab Research Equipment
- › Retrofit and Rebuilds



› Fenn

Stanvac™



SUPERON®

We have pleasure in introducing ourselves as India's leading organization in the field of high performance industrial maintenance consumables – welding electrodes, stainless steel wires, protective coatings, speciality lubricants....



Stanvac – Superon Group : Corporate Office, Gurgaon, Haryana, India

Our group was established in the year 1994 & today comprises of three organisations:-

a) **STANVAC CHEMICALS INDIA LTD, NEW DELHI** : Import & Distribution of specialized Industrial Maintenance Consumables, Electrical Cleaning & Insulation, Passive Fire Protection, Speciality Lubricants, Environment Friendly Industrial Cleaners, Long duration Corrosion Protection Coatings... via exclusive tie – ups with various global leaders:

M/s Aervoe Industrial Inc-USA, Conoco Phillips-USA, Chemtoof-USA, Sentinel-USA, Weicon-Germany, AIK Flammadur-Germany, Action Can-UK, Chemcoint-UK....

b) **SUPERON SCHWEISSTECHNIK INDIA LTD:** Licenced manufacturing of a range of Welding Electrodes (Conventional as well as Maintenance), Stainless Steel Wires, Lubricants, Passive Fire Materials, Anti-Corrosion Coatings, Aerosol Sprays in technical collaboration with:

- ★ M/s Oerlikon Schweisstechnik AG-Switzerland (Air Liquide Group-France)
- ★ Kjellberg Finsterwalde-Germany
- ★ Aervoe Industrial Inc-USA, Sentinel-USA...

In addition at our TUV certified, state of the art stainless wire drawing facility, a full range of stainless steel MIG & TIG wires, in different grades are being produced, using imported equipment & the highest international processing standards, for world class quality, superior to that presently available in India.



Plant II – Manesar : Welding Electrodes, Aerosols & Speciality Lubricants

c) **SUPERON HYUNDAI** : Authorised Sales & Service M/s HYUNDAI MOTORS LTD - Gurgaon region, New Delhi.



Plant III – Gurgaon : Stainless Steel Wires & Speciality Coatings, Fire & Anti - Corrosion

Group turnover is Rs >500 crs (USD 90m) per annum, with over 1500 employees including sales & service engineers. We have 350 stocking distributors located all over India.

State of the art, ISO certified manufacturing facilities are located at Okhla - New Delhi, Manesar & Gurgaon -Haryana .

Our organisation is a national leader in advanced technology industrial maintenance consumables & we offer a single window supply & service source for world class fully warranted supplies.

Today, in India, our range represents the most modern technology and the highest quality currently available world-wide, in these product segments.

Stanvac - Superon Group

Corporate Office: 552, Sector – 37, Pace City – II, Gurgaon, Haryana - 122001, India Tel.: (124) - 4940900
E-mail : sales@stanvac.com, sales@superonindia.com Web site : www.stanvac.com, www.superonindia.com

Tribotesters

Four Ball Test Machines

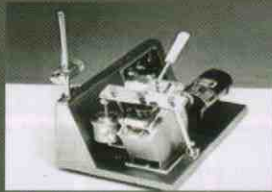
For EP and Wear Test as per

ASTM D2596, D2783, D2266, D4172,
D5183, IP 239, GOST 9490-77



Imperial Four Ball EP & Wear Tester is a useful tool in developing lubricants for special application and comparing relative performance of candidate material.

Panel Coker



Imperial Panel Coking Apparatus is designed to determine the tendencies of finished oils from coke when in contact with surfaces at elevated temperatures.

Performing to FTM Standard 791, the unit is supplied with PID temperature-indicating controllers for regulating the temperature of the test panel oil in the sump and air.

Specs:

Variable Drive Motor
Digital Speed Display
Air Flow Regulator System
Digital Temperature Display
Cyclic Timer for Alternate Splash Bakes

Optional
SO2 Modified System

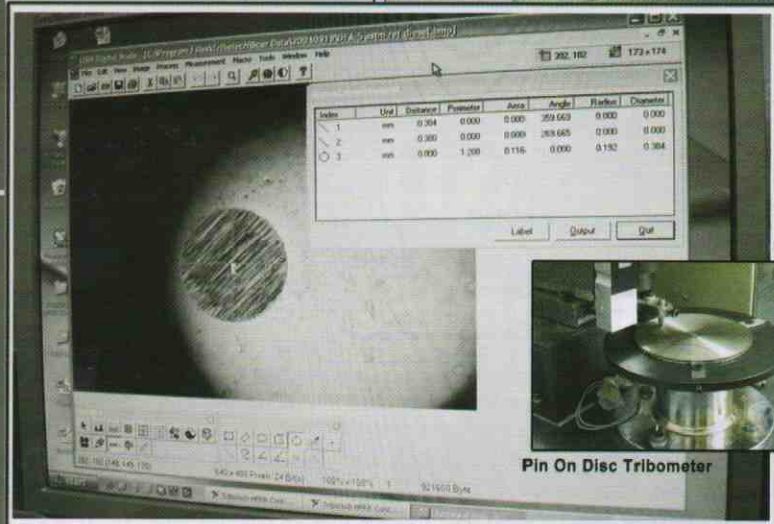
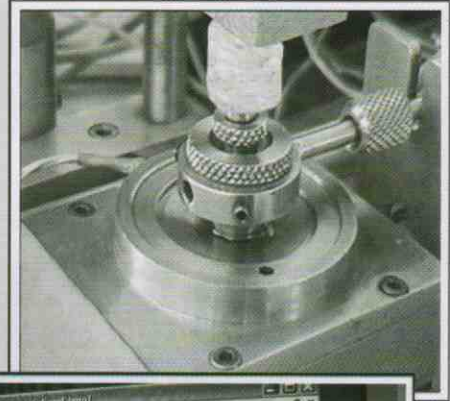
HFRR

High Frequency Reciprocating Test Rig

For Conducting

Diesel Fuel Lubricity Tests
As per:

ASTM D6079-97
ISO 12156-1
ISO 12156-2
EN 590:1998
JPI-5S-50-9
IP 450/2000



Pin On Disc Tribometer

Features :

- Fully Automated
- Advanced Scar Measurement System
- User Friendly, Flexible & Dedicated Software
- Excellent Repeatability & Reproducibility Results
- Advanced Data Analysis



Imperial Scientific Industries

Voice : +1 (201) 604-6754 Fax : +1 (201) 604-6755

Toll Free: +1 (800)-720-0683

www.frictionNwear.com * sales@frictionNwear.com

NORIA India Training Calendar

PUNE | 31st Jan 2013 to 2nd Feb 2013 | Fundamentals of Machinery Lubrication

MUMBAI | 4th Feb 2013 to 6th Feb 2013 | Practical Oil Analysis

Chennai | 7th Feb 2013 to 9th Feb 2013 | Fundamentals of Machinery Lubrication



ICML Certification testing is available after most of the courses listed. Please visit www.lubecouncil.org for more information on certification and test dates.

Principal Faculty : Andy Sitton

(ICML: MLA I & MLA II and MLT I & MLT II, LLA I.) STLE: Oil Monitoring Analyst I (OMA-I)

For more information, visit www.noria.com or
Call Kaushick Soren on +91-9031732706 or E-mail : info@tribologysolutions.com

We believe in
making things
better
with age



We are India's 1st Vendor
Neutral Total Fluid
Management Company.

We take care of your
Lubricants & Coolants to
ensure you derive the best
value from them. Not less,
to waste resources, not
more to damage your
machines. Our scientific
approach ensures lower
cost of lubricants/coolants,
higher machine reliability
and reduced maintenance
cost and down time.



Solutions Unlimited

VAS TRIBOLOGY SOLUTIONS PVT. LTD.

Marketing Office : Rider House, 136, Sector-44, Gurgaon-122003 (Haryana),
National Capital Region, India

Operations Office : 213, Ashiana Centre, Adityapur, Jamshedpur-831013, India
info@tribologysolutions.com | Praveen Kumar : +91-9608683372, +91-657-2383238

For complete list of our services visit : www.tribologysolutions.com

X'tralife by your service partner



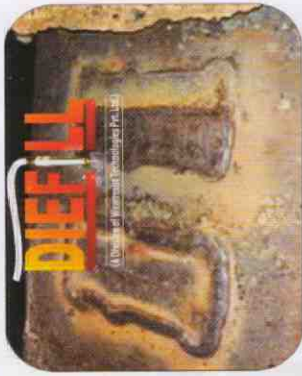
Wearresist Technologies Private Limited
An ISO 9001 : 2008 Company



Your Solution Provider For Welding



Your Roll Welding Partner



Diefill = Longevity Of Dies



Get maximum from your flux cored wires



Agency Products



X'tralife Modular Products



X'tralife Welding & Maintenance Products



X'tralife Coating & Sprays

Wearresist Technologies Pvt. Ltd

749/9, GIDC, Makarpura, Vadodara - 390 010, Gujarat (INDIA)

Ph.: +91-265-2651548, 6581131, Fax : +91-265-2649085

E-mail : custsupport@wearresist.com

Website : www.wearresist.com



ICIT 2012

**The Next Asian Tribology Conference
ASIATRIB-2014**

will be organised
from **27-30th January 2014**
at
New Delhi, India

Please contact
info@tribologyindia.org
or visit www.asiatrib2014.org
or www.asiatrib2014.in for more details.

Tribology Society of India

Contact Address:

C/o Indian Oil Corporation Limited
Research & Development Centre,
Sector-13, Faridabad-121007
Phone no :+91-129-2294680
Email: info@tribologyindia.org
www.tribologyindia.org



SERVO[®] FUTURA SYNTH

AS ADVANCED AS TOMORROW.

100% synthetic engine oil for new generation petrol cars • Blended with Polyalphaolefins-Group IV base oils

- Superior all-weather performance • Controls sludge formation & other harmful deposits
- Keeps engine exceptionally clean with consequent benefit of fuel efficiency
- Outstanding engine protection through effective anti-wear capability
- Conforms to advanced SN level of performance of the American Petroleum Institute (API)



100% PERFORMANCE. EVERYTIME.

Available in 4 lit and 1 lit packs in select cities at IndianOil Petrol stations and bazaar retailers