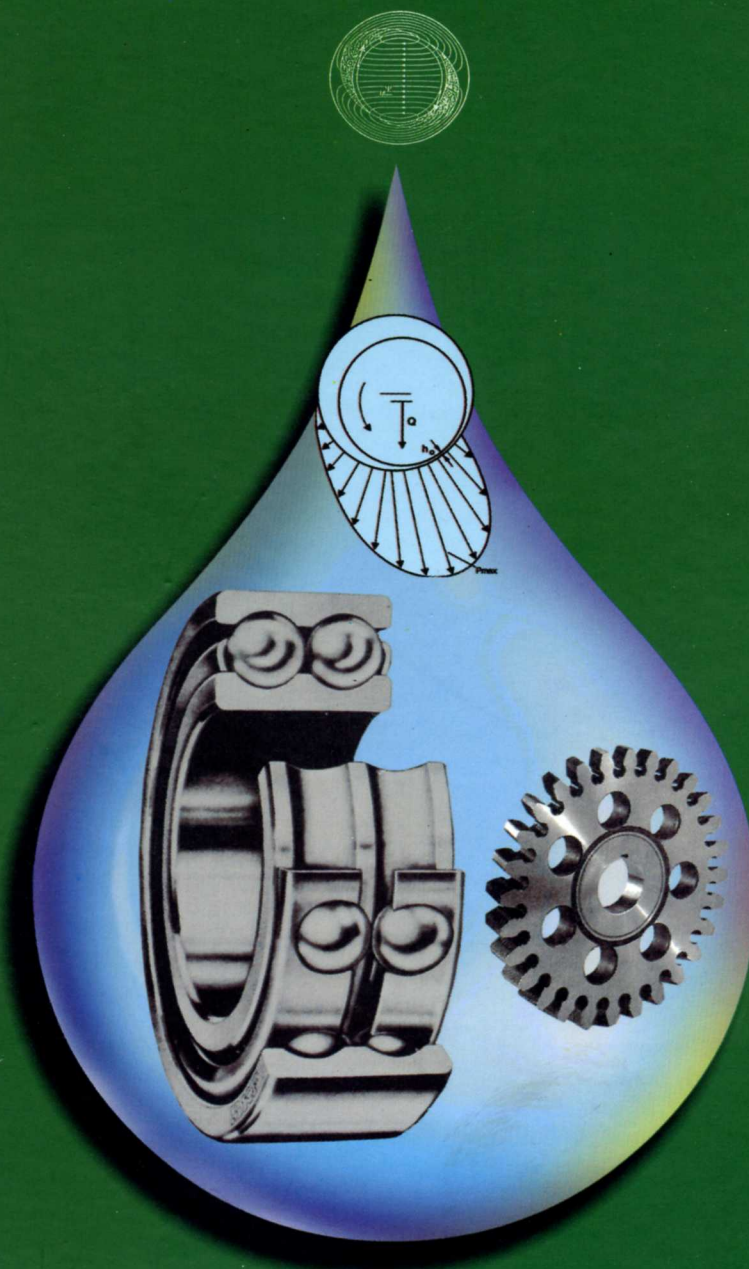


# TRIBOLOGY IN 2000 AND BEYOND

Proceedings of the Second International  
Conference on Industrial Tribology

*December 1-4, 1999*

*Hyderabad, India*



*Editor : H. Prashad*



# **Tribology in 2000 and Beyond**

# Tribology in 2000 and Beyond

*Editor*

**H. Prashad**

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**HYDERABAD, INDIA**



*Organized by*



**BHARAT HEAVY ELECTRICALS LIMITED  
CORPORATE R&D DIVISION**

*Under the Aegis of*



**TRIBOLOGY SOCIETY OF INDIA**



*Dedicated to*



*The Almighty, whose blessings, continued inspiration and silent guidance has nurtured us to follow the path of untiring research for the ultimate progress.....*

November, 1999

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## FOREWORD

Over the years, Tribology has played a major role in ensuring safe and efficient operation of variety of industrial machinery. It has gained increasing importance in many respects including energy conservation by optimum design of machinery following correct tribological practices. Industry has realized that Tribology is a techno-economical tool for maintainability and reliability. Tribology Society of India has made a significant contribution in creating awareness of Tribology by way of organizing conferences, seminars and publications of News Letters and TSI Journal.

The **Second International Conference on Industrial Tribology** with a theme of **Tribology in 2000 and Beyond** offers a platform to focus the achievements of Tribology by 2000 and the future advancement of this discipline in the 21st Century. The Conference will mainly deal with the use of synthetic, environment friendly, multigrade lubricants, friction modifiers, increased wear resistant surface treatment, use of magnetic bearings and optimum energy saving bearing design to enhance the performance of the equipments. The papers included in this proceeding will certainly be of interest to the delegates drawn from wide cross-section of industries like steel, petroleum, engineering, power generation as well as from academic institutions and research laboratories from India and abroad.

I hope that the Conference will be able to identify the likely knowledge gaps and evolve a plan to fill up the gaps for the benefit of Tribologists of our country and abroad.

I wish the Conference all success.

**Dr. A. Prabhakara Rao**  
*General Manager Incharge*  
BHEL, Corporate R&D Division  
Hyderabad

## FROM THE ORGANISING SECRETARY

Effective utilization of energy is technically not effective without the technological advancement in Tribology. Researchers and practicing engineers both have to interact very closely to fill up the know-how and know-why gaps prevailing between theory and practice in this area. Also, the Government has to take measures to draw attention of people for adopting the correct tribological practices in this regard.

The theme of the conference - **Tribology in 2000 and Beyond** - was chosen considering present know-how gaps and status of Tribology in this century and the orientation to be adopted in the next century. It would be a matter of great satisfaction if appropriate thoughts and directions for perspective development can emerge out of the deliberations of the conference.

**Tribology in 2000 and Beyond** is divided into ten broad areas besides keynote / plenary session. Each area has been dealt by individual session organizer of International repute for selection, review of the papers and conduct of the session. Besides this special session on ***“Energy Efficient Bearings and Tribology in 2000 and Beyond”*** by presentations of papers selected exclusively in the frontier areas is also organized. One day four parallel Technical courses relevant to industries are also planned before the conference. Furthermore, panel discussion is planned on ***“Automotive Pollution - Role of Lubricants”*** apart from the ***“Tribology in 2000 and Beyond”***.

ICIT-99, under the aegis of Tribology Society of India is the second conference after 1984, being organized by BHEL, Corporate R&D division at Hyderabad. On behalf of organizers, I thank the Executive Committee of TSI for granting us this privilege and opportunity.

ICIT-99 is the result of inspired team effort. Apart from my colleagues from BHEL, Corporate R&D Division and the Executive Committee of TSI, I am grateful to the Tribologists and practicing professionals of our country and abroad, who have contributed towards this venture. I am thankful to all the delegates, authors and keynote speakers, who have participated/contributed to this conference. I am thankful to the Chairman and Managing Director of BHEL, Director (Engg, R&D), General Manager Incharge R&D, Steering Committee members for their encouragement and valuable guidance, as also the sponsors, co-sponsors and supporters who have extended their whole-hearted assistance in organizing the conference.

**Dr. Har Prashad**  
*Sr. Dy. General Manager*  
B.H.E.L., Corporate R&D Division  
Hyderabad, India

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