
Name : Rathindranath Maiti

**Present Position : Professor, Mechanical Engg. Dept.,
Indian Institute of Technology (IIT), Kharagpur, India.**

Born : 1st. September, 1953. (India)

**Office: Department of Mechanical Engineering
(Fluid Power and Automation Laboratory)
Email- rmaiti@mech.iitkgp.ernet.in
Fax: ++91 (3222) 282278/255303
Phone- ++91 (3222) 282938 (O) / 278092(R)/
Mob: ++919434065298**



Areas of Interest:

Teaching (Present) : PG Level: Mechanical Drives (Theory), Fluid Drive & Control (Theory),
Design and Dynamics laboratory (Practice).
UG Level: Design of Machine Elements (Practice).

(Earlier) : Advanced Mechanics of Solids, Industrial Automation, Mechanical handling subjects like-
Conveying and elevating equipment , Electrohydraulic Servo Systems in Mechanical Handling,
Design of Machine Elements (Theory & Practice), Engineering Mechanics.

Research : Mechanical Power and Fluid Power Transmission
(Gear Engineering, Fluid Power and Hydrostatic Transmission)

Education: Ph.D., 1990 : Mechanical Engineering, IIT, Kharagpur
(Studies on Orbital Rotary Piston 'LSHT' Hydrostatic Motor- Low Speed Performance and Design)
M.Tech., 1977 : Mechanical Engineering, IIT, Kharagpur ,
Topper in Specialization (Mechanical Handling Science and Technology)
B.E., 1975 : Mechanical Engineering, Burdwan Univ. , 1st. Class.

Employment/Experience: In Teaching & Research-28 yrs. In Industry (Design & R&D)-10 yrs.:

Full Professor (Since Aug, 2004), Mechanical Engineering Department,
Indian Institute of Technology (IIT), Kharagpur.
Associate Professor (Feb,1998), Assistant Professor (Jan, 1994), Ad-hoc Lecturer (Nov, 1991);
Research Associate CSIR (1987-'91), Research Scholar & Teaching Asst.(1985-'86).
2013(May) - 2013 (June) : Visiting Scientist [A scheme of PAS (Polish Academy of Science) and INSA,
(Indian National Science Academy), India] in Cracow university of Technology (CUT), Poland.
2010(May) - 2010 (July) : Visiting Scientist [A scheme of DAAD, Germany],
& **2004(May) - 2004 (July)** Fluid Power Institute, TU, Dresden
1998(June) - 1998 (Sept) : Visiting Scientist [A scheme of The Royal Society, UK and INSA, (Indian
National Science Academy), India] in Cardiff School of Engg., UK.
1995(Nov) - 1996 (Nov) : Senior Design Engineer (One year visiting position)
Sumitomo Eaton Hydraulics Co., (SEHYCO),Kameoka, JAPAN.
1979(May) - 1985(Jul) : Design & Development Engineer, Material Handling Equipment Division,
Macneill & Magor Ltd., Kolkata (Calcutta), India.
1977(Jan) - 1979(Apr): Aeronautical Engineer [Design Trainee (up to June 1978)], Transmission Group,
Design Complex (Helicopter), Hindustan Aeronautics Ltd.(HAL),Bangalore, India.

Publication: 50 in peer reviewed journals and conference proceedings. **Patent:** 4.

Reviewer of papers - ASME, IMechE (UK), IFToMM and other journals.

Research Guidance (Field: Mechanical Power Transmission & Gearing, Fluid Drive and Control)

Doctoral Level : Completed – 4, In Progress -4

Masters Level : Over 35, including 3* under DAAD-IITs Sandwich Scheme.

(*In collaboration with IFD, TU-Dresden, Germany in 1999-2000, 2003-04, 2009-10).

Lab Development: Introduced and Developed a *Fluid Power and Automation Laboratory*
in our Department (Mechanical Engineering).

Short term course organization: i). *GAIN-* Fluid drive and Alternative Drives, and Control in Aerospace Actuation Systems,
Dec 05-13, 2016, By Prof. Jean-Charles Mare, INSA, Toulouse, France.

(Joint Organizer- Prof. M. C. Laha, AED, IIT Kgp).

ii). Lectures on Mechanical Drives (Feb 01-12, 2016) - By Prof. Jean-Charles Mare, INSA, Toulouse, France.

iii). Lectures on Digital Hydraulics (Nov 07-12, 2016) – By Univ. Prof. Rudolf Scheidl, JKU, Linz, Austria.

Award: Awarded second prize in the 5th. All India Design Competition for
Engg. Students, 1973, Organized by the Institution of Engineers (India).

LIST OF PUBLICATION & PATENT

PUBLICATIONS: *International Refereed Journals* (Latest first):

Published :

1. Sahoo, V. & Maiti, R. (2016): Static load sharing by tooth pairs in contact in internal involute spur gearing with thin rimmed pinion. **Proceedings of IMechE (UK), Journal of Mechanical Engineering Science, Part C. 30(4): 485–499**, [Also reprinted in the *Special Issue: Power Transmission with Gears*, 230 (7-8)] DOI: 10.1177/0954406215618424.
2. Routh, B., Maiti, R. Sobczyk, A. & Ray, A. K. (2016): An investigation on secondary force contacts of tooth pairs in conventional harmonic drives with involute toothed gear set. **Proceedings of IMechE (UK), Journal of Mechanical Engineering Science, Part C. 230(4) : 622–638**, DOI: 10.1177/0954406215577983.
3. Maiti, R.; Biswas, I.; Nema, V.; Basu, S.; Mahanto, B.S. & Routh, B. (2013): Design and development of strain wave generating cam for a new concept 'Harmonic Drive'. **Proceedings of IMechE (UK), Journal of Mechanical Engineering Science, Part C: 227(8): 1870-1884**, DOI: 10.1177/0954406212466354.
4. Nag, A. & Maiti, R.(2012): Unification of Epitrochoid origin profile design approaches for external lobed Star member used in hydrostatic and gear units. **Proceedings of IMechE (UK), Journal of Mechanical Engineering Science, Part C: 227(2), 299-310**, DOI : 10.1177/0954406212448365.
5. Maiti, R. (2004): A Novel Harmonic Drive with Pure Involute Tooth Gear Pair. **ASME Journal of Mechanical Design. 126(1):178-182**.
6. Maiti, R.; Saha, R. & Watton, J. (2002): The Static and Dynamic Characteristics of a Pressure Relief Valve with Proportional Solenoid Controlled Pilot Stage. **IMEchE Journal of Systems and Control Engineering, UK, Part-I, 216: 143-156**.
7. Raghunandana, K.; Majumdar, B. C. & Maiti, R. (2001): Stability of Flexibly supported oil journal bearings using non-Newtonian lubricants : Linear Perturbation analysis. **ASME Journal of Tribology (Technical Brief), 123(3):651-654**.
8. Maiti, R. & Nagao, M. (1999): Prediction of Starting Torque Characteristics of Epitrochoid Generated Orbital Rotary Piston Hydraulic Motors, **JSME International Journal of Mechanical Systems, Machine Elements and Manufacturing, C 42(2):416-426**.
9. Dasgupta, K.; Mukherjee, A & Maiti, R. (1999): Estimation of Critical system Parameters that affect Orbit Motor performance- Combining Simulation and Experiments. **ASME Journal of Manufacturing Science and Engineering, 121(2):300-305**.
10. Dasgupta, K.; Mukherjee, A. & Maiti, R. (1996): Theoretical and experimental studies of the steady state performance of an orbital rotor LSHT motor. **Proceedings of IMechE (UK), Journal of Power and Energy, A 210 (6):423-429**.
11. Dasgupta, K.; Mukherjee, A & Maiti, R. (1996): Modelling and Dynamics of Epitrochoid generated Orbital Rotary Piston LSHT Hydraulic Motor- A Bondgraph approach. **ASME Journal of Manufacturing Science and Engineering, 118 (3):415-421**.
12. Maiti, R. & Roy, A. K. (1996): Minimum possible tooth difference in involute internal-external gear pair. **Mechanism and Machine Theory, 31 (1):475-485**.
13. Maiti, R. (1993): Active Contact Problems in Epitrochoid Generated 'Floating Axis' Orbital Rotary Piston Machines. **ASME Journal of Engineering for Industry, 115 (3):337-340**.
14. Maiti, R. (1993): Computer-Aided measurement of flow with rotameter, LDR and PC interfacing. **Experimental Techniques (USA), 17(2):28-30**.
15. Maiti, R. (1993): Torque Characteristics of Epitrochoid Generated Orbital Rotary Piston type Hydraulic Motors. **Mechanism and Machine Theory, 28(2):225-231**.
16. Maiti, R. (1992): Distributor valve port sequences in epitrochoid generated rotary piston type hydrostatic units. **Archive of Applied Mechanics, 62:223-229**.
17. Maiti, R. (1991): Active Contact Stresses at Epitrochoid Generated ROTOR-STATOR set of Fixed Axis or Equivalent system 'ROPIMA' type Hydrostatic units, **ASME Journal of Engineering for Industry, 113(4):465-473**.
18. Maiti, R. & Sinha, G. L. (1990): Limits on modification of epitrochoid used in rotary piston machines and the effects of modification on geometric volume displacement and ripple. **Ingenieur-Archiv, 60(3):183-194**.
19. Maiti, R. & Sinha, G. L. (1988): Kinematics of Active Contact in Modified Epitrochoid Generated Rotary Piston Machines. **Mechanism and Machine Theory, 23(1):39-45**.

Refereed Conference/Symposium/Congress Proceedings:

International

(Note: '-----' Indicates Presenting Author)

1. Roy, D., Sahoo, V., Bhatia, R., Maiti, R., Das, P. K., Antoniak, P. & Stryczek, J. (2016): Inter-Chamber Leakage Through Active Contacts in LSHT Orbit Motor - Flow Visualization Through CFD Analysis, Accepted for presentation, Bath/ASME symposium on fluid power and motion control (FPMC 2016), Bath, UK, Sept. 07 - 09.
2. Sahoo, V. & Maiti, R. (2016): State of Stress in Strain Wave Gear Flexspline cup on Insertion of Drive Cam - Experiment and Analysis. Proc. of The 2016 International Conference of Mechanical Engineering (ICME'16), London, U.K., 29 June - 1 July.
3. Arijit, A., Pratihari, D. K. & Maiti, R. (2015): Study on Inverse Dynamics of Full-Body Powered Pseudo-Anthropomorphic Exoskeleton Using Neural Networks, Proc. of 15th International Conference on Hybrid Intelligent Systems 2015, Thailand vol. 420, pp. 295-305. doi:10.1007/978-3-319-27221-4_25
4. Maiti, R., Das, M. K., Sahoo, V., Avula, K. C., Arzare, A., Tolambia, V. P. & Nag, A. (2015): Leakage past Active Contacts in Involute and Cycloidal Gear Hydrostatic Units, Proc. of 14th. Scandinavian International Conference on Fluid Power, SICFP15, 20-23 May, 2015, Tampere, Finland.

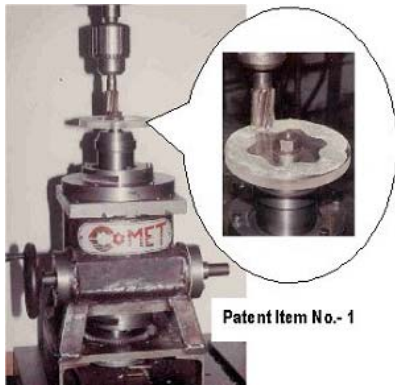
5. Routh, B., **Maiti, R.** & Ray, A. K. (2014): Aspects of lubrication at the wave generator -flexspline interface in strain wave gearing units, Proc. of International Gear Conference 2014, 26-28 August : Lyon, France.
6. **Maiti, R.** & Narayan, P. (2011); An Experimental Investigation on Swash Plate Control Torque of a Pressure Compensated Variable Displacement Inline Piston Pump. Proc. of 8th JFPS International Symposium, Okinawa, Japan. Oct. 25-28, 2011.
7. Routh, B. & **Maiti, R.** (2011): On a Gearing Problem in Conventional Harmonic Drives with Involute Toothed Gear Set. Proc. of the ASME IDETC/CIE 2011 conference, August 29-31, 2011, Washington, DC, USA.
8. Mahanto, B. S. & **Maiti, R.** (2011): Stresses in Flex Gear Cup due to Insertion of Wave Generating Cams in Harmonic Drives, Proc. of 13th. World Congress in Mechanism and Machine Science (IFTToMM). Guanajuato, Mexico, 19-25 June, 2011.
9. Saha, R., **Maiti, R.** & Helduser, S. (2008): Steady State Force Characteristics and Sensitivity Analysis of a Proportional Solenoid Pilot Operated Two Stage Pressure Relief Valve. Proceedings of ICHP-08, Sep 29- Oct 01, Prague, pp. 120-128.
10. Nag, A., Basu, S. & **Maiti, R.** (2008): Estimation of Stresses in Components and Gap in Active Contacts of Epitrochoid Generated Floating Axis ROPIMA type Hydrostatic Units- An FEM Approach. Proceedings of ICHP-08, Sep 29- Oct 01, Prague, pp. 129-136.
11. **Maiti, R.** (2004) : Invited Lecture-On Fluid Power Activities in India and IIT, Kharagpur, 3rd. FPNI, PhD Symposium, 30 June-4 July 2004, Terrassa, Spain.
12. Choudhuri, K., Patra, S. & **Maiti, R.** (2002): A novel Torque Amplifier using Alternating Flow hydraulics and Orbital Rotary Piston Hydraulic Motor Principles- Design and Performance, Proceeding of the 5th. JFPS International Symposium on Fluid Power, (Nov 13-16), Nara, Japan. Vol.-2, Paper No. 2C25, pp. 555-560.
13. Saha, R. & **Maiti, R.** (2002): Proportional Solenoid Control Pressure Relief Valve: Performance study through Modelling, Simulation and Experiment, Proceeding of the 5th. JFPS International Symposium on Fluid Power, (Nov 13-16), Nara, Japan. Vol.-3, Paper No. 3C15, pp. 757-762.
14. Raghunandana, K.; **Majumdar, B. C.**; & Maiti, R. (2000): "Stability of rigidly supported oil journal bearings using non-Newtonian lubricants : comparison of linear and non-linear analysis", CD Proceedings of the *International Tribology Conference (ITC Nagasaki)* in Nagasaki during Oct. 29-Nov. 2, 2000.
15. **Maiti, R.** & Roy, A. K. (2000): "A Wave Generator of New Concept for Flexgear of Harmonic Drive with Pure Involute Tooth Gear Pairs (PTG-14458)", CD Proceeding of the (8th. *International Power Transmission and Gearing Conference*,) ASME DETC 2000, Sept. 10-13, 2000, Baltimore, Maryland, USA.
16. Saha, R.; Khutia, N. & **Maiti, R.** (2000): "Stability Analysis of A Load Sensing Hydraulic Transmission System-Modelling and Simulation Approach (DAC-14534)", CD Proceedings of the (26th. *Design Automation Conference*,) ASME DETC 2000. Sept. 10-13, 2000, Baltimore, Maryland, USA.
17. Maiti, R.; Surawattanawan, P. & **Watton, J.**, (1999): Performance prediction of a proportional solenoid control pressure relief valve", Procds. of the 4th. JHPS International Symposium on Fluid Power, Nov 15-17, Tokyo, Japan.
18. **Maiti, R.**; Pan, S & Bera, D (1996): Analysis of a load sensing hydraulic flow control valve. Proceedings of the Third JHPS International Symposium on Fluid Power; Nov. 4-6, 1996, Yokohama, Japan, pp. 307-312.
19. **Maiti, R.** (1995): Analysis of Rotary Flow Distributor Valve of an LSHT Hydrostatic Motor. Proceedings of the Ninth World Congress on the Theory of Machines and Mechanisms; Milan, Italy August 30-31/ September 1-2, 1995, v-4, pp. 2698-2702.
20. Maiti, R. (1995): A Review on Geometric Design of Rotor-Stator set of ORBIT motor - a unique LSHT hydrostatic unit. The Second International Symposium on Fluid Power Transmission and Control ISFP'95; Oct. 5-7, 1995, Shanghai, China.
21. Dasgupta, K.; **Mukherjee, A.** & Maiti, R. (1994): Analysis of an LSHT Hydrostatic Transmission System: A Bondgraph approach. Proceedings of CISS, the First Joint conference of International Simulation societies. Aug 22-25, ETH Zurich, Switzerland.
22. Maiti, R. (1989): Contact Stresses at the Active Contacts of Epitrochoid Generated Rotor-Stator set in "ROPIMA" type 'LSHT' Hydraulic Motor. Proceedings of the 2nd International Conference on Fluid Power Transmission and Control (89 ICFP), Zhejiang Univ., Hangzhou, China, Mar 20-22, pp.251-257.

National

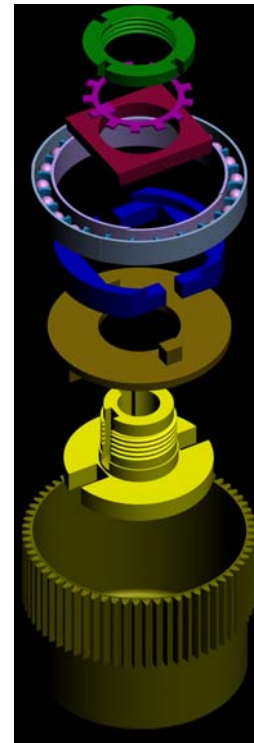
23. R. Maiti & **R. Saha**, (2001): Dynamic Performance Predictions of a Pressure Relief valve with a Proportional Solenoid -controlled Pilot Stage, Proceedings of NaCoMM-01, (Dec 21-23), IIT, Kharagpur
24. Sengupta, S. & Maiti, R., (1999), "Modelling and Simulation of Proportional Solenoid Two Stage Pressure Relief Valve", Procds. of the National Conference on Machines and Mechanisms NACOMM 99, IIT, Bombay, Dec. 15-16. pp. 87-97.
25. **Saha, R.** & Maiti, R., (1999), "Understanding Direct Acting Proportional Solenoid Directional Control Valve-Performance study through MATLAB-SIMULINK", Procds. of NACOMM 99, IIT, Bombay, Dec. 15-16. pp. 98-107.
26. **Maiti, R.** (1997): Improving the performance of an LSHT hydraulic motor by Valve Timing lead and lag - an experimental investigation. Proceedings of 24th. National Conference on Fluid Mechanics and Fluid Power (FMFP). B.E.College, Shibpur, Dec 27-28, pp. G16-19.
27. **Maiti, R.** (1997): Mechanics of Load Sharing by Tooth pairs in Involute Gearing. Proceedings of NACOMM 97, IIT, Kanpur, Dec. 12-13, pp. A55-60.
28. Maiti, R.; Chattopadhyaya, A. B. & **Ram Mohan, Ch.**; (1993): Design and development of an epitrochoid generating machine. Procds. of NACOMM 93. IIT, Kharagpur, India, Dec 23-24, pp.216-224.
29. Maiti, R. & Sinha, G. L. (1987): The Mechanics of Sliding at the Rotor-Stator Slip Flow Region of the Epitrochoid generated ROPIMA. Procds. of the 3rd. NACOMM 87. VJTI, Bombay, India, Dec, pp.E3, 21-28.
30. **Maiti, R.** & Sinha, G. L. (1985): Two-Gear Planetary Drive with Involute Teeth and its Efficiency. Proceedings of the 2nd NACOMM 85. IISc, Bangalore, India, Feb, pp.264-272.
31. Maiti, R. & Sinha, G. L. (1984): On classification of LSHT Hydraulic Motors", Proceedings of the 13th. National Conference on FMFP. REC, Tiruchirapalli, India.

Patent

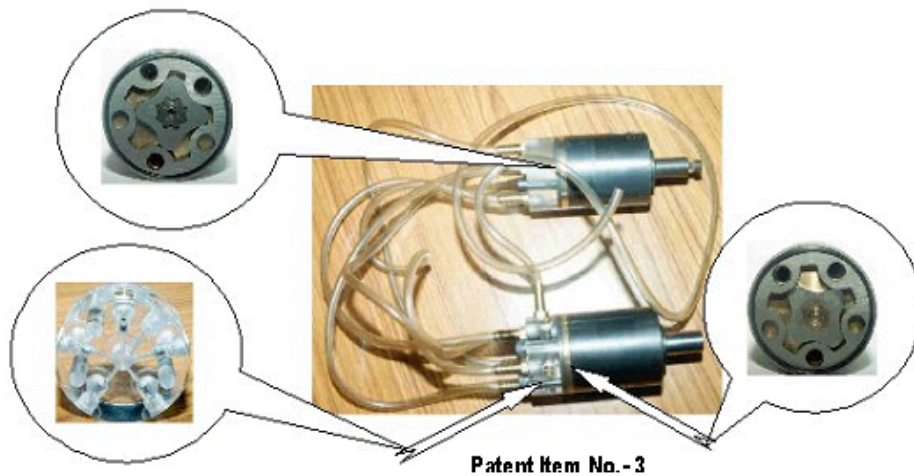
1. R. Maiti.; Assignee- IIT, Kharagpur.(2009): An Improved Split Cam Assembly and an Improved Harmonic Drive (Strain Wave Gearing) System Comprising the Cam Assembly. Patent Application No. 1457/KOL/2009 dated 17.12.2009.
2. R. Maiti.; Assignee- IIT, Kharagpur.(2001): A novel torque amplifier using alternating flow hydraulics and epitrochoid generated rotary piston hydraulic motor principles. Indian Patent Application No.- 648/Cal/2001, dated November 21, 2001. (TAAFER-II). Patent granted: Ref: 648/CAL/01-K Dated 20.03.06.
3. R. Maiti.; Assignee- Self (1995): An Improved Drive System such as a Two-Gear Epicyclic Drive Similar to Harmonic Drive System. Indian Patent No. 186322 of 25-10-1995 (Application No.- 1296/Cal/1995).
4. R. Maiti. Assignee- Self. (1993): A machine for generating a motion to generate internal and external epitrochoids. Indian Patent Application No.- 501/Cal/1993, (Accepted and published in gazette. Sealing was not done as I was in Japan when notified).



Patent No.-2



Patent No.-4



Following Designs were considered for Patent application by M/S Sumitomo Eaton Hydraulics, Japan and the company was assigned for Patent right as per agreement of my job in that company during 1995-1996.

5. R. Maiti.; Assignee- SEHYCO, Japan (1996): A hydraulic motor with improved ring retainer mechanism.
6. R. Maiti.; Assignee- SEHYCO, Japan (1996): A hydraulic motor with improved flow distributor valve.
7. R. Maiti.; Assignee- SEHYCO, Japan (1996): A torque amplifier hydrostatic transmission device (TAAFER-I).

PhD Thesis Guidance:

1. Analysis of Active Contacts in Epitrochoid Generated Form Closed Rotor-Stator set with specific reference to Hydrostatic Motor Performance (2015) : Dr. Abhijit Nag
2. Studies on a Pressure Relief Valve with Proportional Solenoid-Controlled Pilot Stage (2004) : Dr. Rana Saha.
3. Effect of Non-Newtonian Lubricant on Stability of Journal Bearings (2000) : Dr. Raghunandana K. (Joint Supervisor: Prof. B. C. Majumdar, MED, IIT Kgp.)
4. Modelling and Dynamics of Epitrochoid Generated Orbital Rotary Piston LSHT Hydrostatic Motor and Transmission System (1995): Dr. Kabir Dasgupta (Joint Supervisor- Prof. A. Mukherjee, MED, IIT Kgp.)
5. Topic: On Contact Pattern in Conventional harmonic Drive with Involute Gear set. (Ongoing)- Mr. Bikash Routh. (Joint Supervisor.- Prof. A. K. Ray of BIT, Mesra, India where thesis will be submitted).
6. Topic- Some design aspects of Harmonic Drives, (Ongoing)- Mr. B. S. Mahanto.
7. Topic- Load sharing by tooth pairs in internal gearing, (Ongoing)- Mr. Vineet Sahoo.
8. Topic- On Some Design and Performance Aspects of Gear Type Hydrostatic Units, (Ongoing)- Mr. Debanshu Roy. (Joint Supervisor.- Prof. P. K. Das, MED, IIT Kgp.)

MTech & MS Thesis Guidance (2001 onwards, Selected thesis):

1. Studies on Proportional Pilot Operated Pressure relief Valves of Two Different Designs- (Performance Analysis by Modelling & Simulation)- (2012) : M.Tech Thesis by Arindam Das.
2. Investigation on Load Sharing by Internal-External Involute Gear Pairs in Contact.- (2012): MTech Thesis by Vineet Sahoo.
3. Some Studies on a Pilot Operated Pressure Relief Valve- (2010) By Mr. Nirmal Kumar (MTech Thesis under DAAD Scheme. Joint Supervisors: Univ. Prof. Dr.-Ing. J. Weber (Director, IFD) & Univ. Prof. Dr.-Ing. S. Helduser, (Ex-Director, IFD) TU, Dresden)
4. Some studies on Stresses in Thin rimmed Gears- With specific reference to its application in Harmonic Drive (2006) : By Indraneel Biswas (MS Thesis Joint Supervisor- Prof. M. C. Roy, MED, IIT Kgp.)
5. Performance Prediction of Position Regulated Proportional Solenoid Control Pressure Relief Valve (2004) : By Mr. Ashwini B. Katre (MTech Thesis under DAAD Scheme. Joint Supervisor: Prof. Dr.-Ing. S. Helduser, TU-Dresden)
6. Modelling and Simulation of Proportional Solenoid Pressure Control Valve (2001) : By Mr. Sandesh S. Sawant (MTech Thesis under DAAD Scheme. Joint Supervisor: Prof. Dr.-Ing. S. Helduser, TU- Dresden)

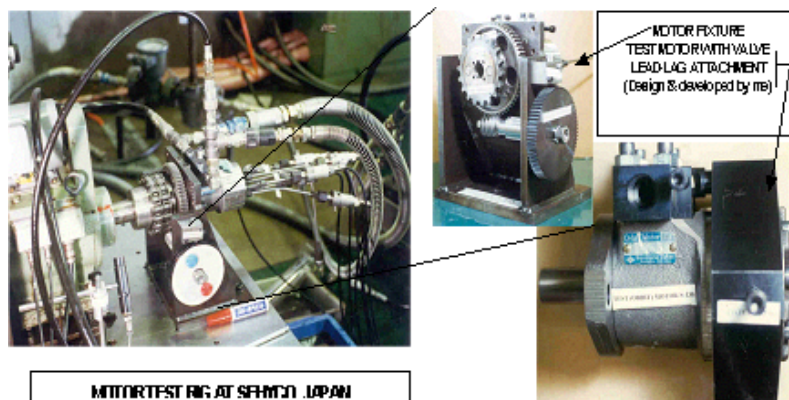
ADDITIONAL INFORMATION:

A Brief on Industrial Experience:

In Helicopter Design Bureau, HAL Bangalore (Jan 1977-Apr 1979): I was mainly involved in mechanical design of main rotor and tail rotor gear boxes, Design-Analysis of Planetary Gear for load sharing by planet gears, Gymbol mounting, Elastomeric vibration isolator for the main gear box.

In Macneill and Magor Ltd., Kolkata (May 1979-Jul 1985): I was sole design and development in-charge of a HST traction Fork Lift Truck. I was also associated with the design of a portable conveyor and various new developments such as PR Gear unit which is an akin to harmonic drive/cycloid speed reducer.

In SEHYCO, Japan (Nov 1995- Nov 1996): I was mainly working on the performance and design improvement of ORBIT motors. Among several proposed improvements prediction of starting torque efficiency and performance improvement by valve lead lag of ORBIT motor are two major works to mention. Three designs were considered for patents in Japan.



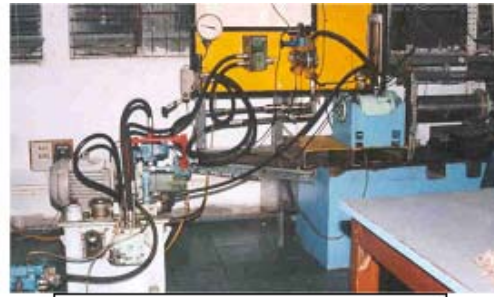
Publication: Sl. no. 4 (see the list of publication) Patent: Sl. No. - 4, 5 & 6(see the list of patent)

A View of the Fluid Power and Automation(FPA) Laboratory

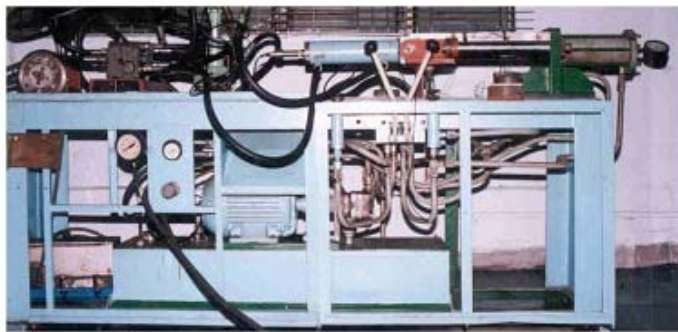
(I started developing these setups since my joining in IIT, Kharagpur in 1991. The laboratory has received separate identity and named in 2000. Most of the setups are Designed and developed by me.)



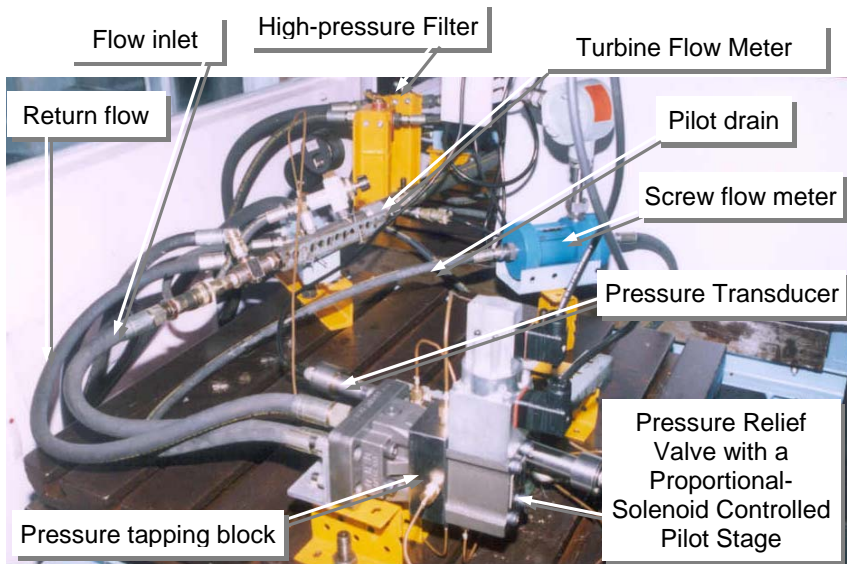
OVERALL VIEW OF THE LABORATORY



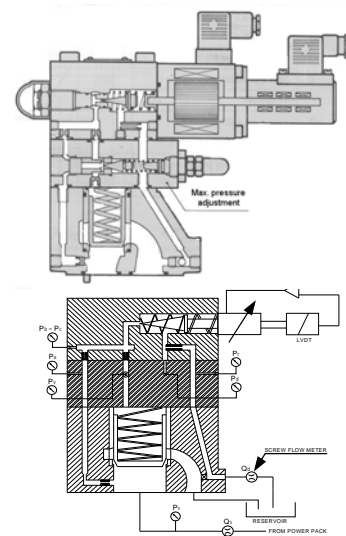
LIGHT MOTOR PERFORMANCE TEST RIG



PRIORITY VALVE PERFORMANCE TEST RIG



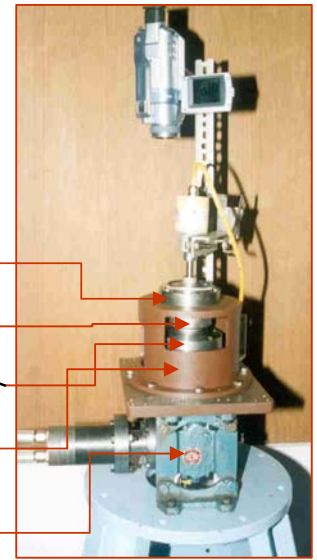
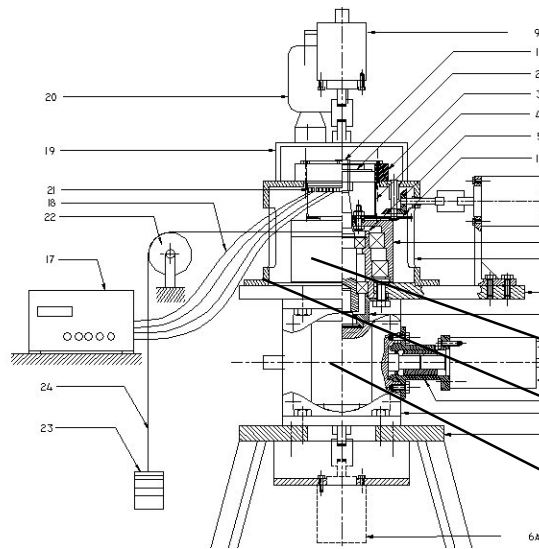
(a) Experimental Set-up



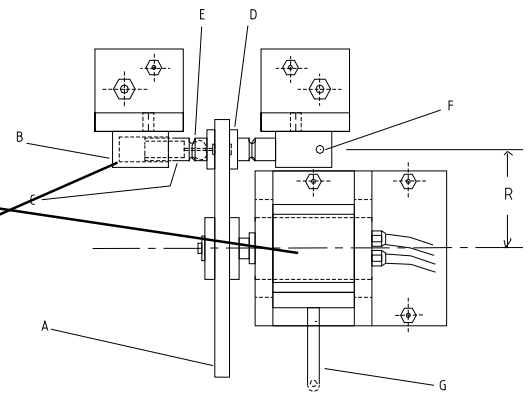
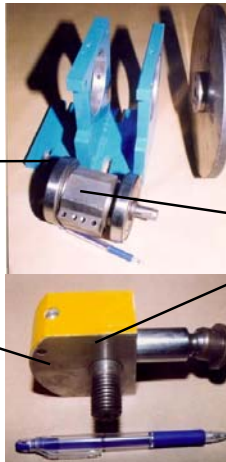
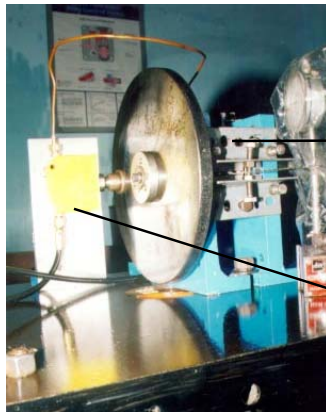
(b) Proportional Solenoid Control Pressure Relief Valve (PPRV)

Experiments on PPRV (MHRD Project)

1	SHAFT	
2	WAVE GENERATOR	HARMONIC DRIVE (REDUCTION 1:78)
3	RING GEAR	
4	FLEX GEAR	
5	FIXED SUPPORT	
6	HYDRAULIC MOTOR - OPERATED WITH PROPORTIONAL CONTROL VALVE & PLC (SPEED : 500 - 1500 RPM)	
7	ENCODER (AT HARMONIC DRIVE OUTPUT)	
8	BASE PLATE	
9	ENCODER (AT HARMONIC DRIVE INPUT)	
10	WORM REDUCTION GEAR BOX (1:30)	
11	SLEEVE CONNECTOR	
12	BASE TABLE	
13	GEAR TRAIN FOR MEASURING OUTPUT SPEED	
14	OUTPUT SHAFT (LOADING DRUM)	
15	SUPPORT	
16	LOCATOR SLEEVE	
17	STRAIN INDICATOR	
18	STRAIN GAGE/INDICATOR CABLE	
19	TRANSPARENT (PERSPEX) COVER	
20	VIDEO CAMERA	
21	STRAIN GAGES	
22	PULLEY	LOADING
23	LOAD (DEAD WEIGHT)	ARRANGEMENT (ON BOTH SIDES)
24	ROPE	



Experiments on Harmonic Drive (DST Project)



Experiments on Slipper-Pad Lubrication (CSIR Project)



Test rig for LSHT Hydrostatic Unit Performance Test Rig.

Visit to Academic Institutes/Research Organization/Industries Abroad:

Sl.	Name of the Institute/Organization/Industry/Host	Purpose of Visit	Duration
1.	LaMCoS, (INSA Lyon, Université de Lyon,) UMR CNRS 5259, Bâtiment Jean d'Alembert, 20 Avenue Albert Einstein, 69 621 Villeurbanne Cédex, France, Prof. Philippe Velex.	To visit the laboratories and have technical discussion with fellow researchers.	May 27-28, 2015
2.	Institute of Machine Design and Operation, Wroclaw University of Technology, (Politechnika Wroclawska - PWR), Poland. Prof. Jaroslaw Stryczek.	Collaborative Research Work.	Oct 06-17, 2014
3.	Politecnico di Torino - Dipartimento Energia, Fluid Power Research Laboratory (FPRL), Dr. Massimo Rundo	To visit the laboratories and have technical discussion with fellow researchers.	Oct 20, 2014
4.	Cracow University of Technology (CUT) (Politechnika Krakowska im. Tadeusza Kosciuszki - PK) Institute of Machine Design (Host Institute), Faculty of Mechanical Engineering. Dr. hab. Inz. Andrzej Sobczyk,	Visiting Scientist, PAS-INSA international Exchange Programme.	May 22, 2013 To June 18, 2013
5.	Czestochowa University of Technology (Politechnika Czestochowska - PCZ)	One day visit during stay in Krakow.	06 June 2013.
6.	Institute of Machine Design and Operation, Wroclaw University of Technology, (Politechnika Wroclawska - PWR), Poland. Prof. Jaroslaw Stryczek.		12 June 2013.
7.	AGH University of Science and Technology, (Akademia Górniczo-Hutnicza- AGH), Krakow, Poland		17 June 2013.
8.	Institute of Machine Design and Hydraulic Drives , Johannes Kepler University (JKU), Linz, Austria, Prof. Rudolf Scheidl	One day visit	June 24-25, 2013
9.	Eisenbeiss, INNS, Linz, Austria (Gear Industry)		
10.	Institute for Robotics TU-Braunschweig, Germany Univ. Prof. Dr. F. M. Wahl	To visit the laboratories and have technical discussion with fellow researchers.	Aug 26, 2011
11.	MAHA Fluid Power Laboratory, Purdue University, USA Dr. Andre Vacca, Assistant professor.		Sept. 01, 2011
12.	Institute of Machine Design and Operation, Wroclaw University of Technology, Poland Univ. Prof. Dr. Hab. Ing. Jaroslaw Stryczek	To visit the Fluid Power laboratories and to discuss about research activities.	October 03-04, 2008
13.	Institute for Fluid Power transmission and Control (IFAS), (RWTH), Aachen, Germany. Univ. Prof. Dr.-Ing. H. Murrenhoff (Director)		September 28-29, 2008
14.	Bosch Rexroth Ltd., Lohr, Germany Univ. Prof. Dr.-Ing. S. Helduser,	To have technical discussions on a few projects with them and TU-Dresden.	July 15, 2004
15.	Department of Precision Engineering, Kyoto University, Japan Prof. A. Kubo	To have a discussion on manufacturing of Precision Gears for Harmonic Drive.	Nov. 12, 2002
16.	Institute for Fluid Technique, TU-Dresden, Germany Univ. Prof. Dr.-Ing. S. Helduser, Director	Meeting on the progress of a PG student working under IIT-DAAD Scheme	Sept. 13- 22, 2000
17.	Mannesmann Rexroth Ltd., Lohr, Germany Dr.-Ing. H. Lausch	To visit the Factory and to Discuss on HST with Proportional valve technology.	
18.	Eaton Corporation, Fluid Power Dvn., Minneapolis, USA Mr. S. Uppal, Director of Engineering.		
19.	Mech. Engg. & Energy Dvn., Cardiff School of Engg., UK. Prof. J. Watton, Deputy Head of School of Engineering.	Visiting Research Position INSA(India)-Royal Society(UK) Scheme	May31-Sep15 1998
20.	Moog Controls Ltd., Tewkesbury, England, UK Dr. I. M. Whiting, Hydro-Mechanical System Group.	To see the laboratories and R&D Sections and to discuss about research/teaching activities, curricula, collaborative work etc.	During Stay in Cardiff
21.	Mechanical Engineering Department, Birmingham Univ., UK Prof. C. J. Hooke		
22.	Mechanical Engineering Department, Imperial College, UK Prof. H. A. Spike		
23.	Mechanical Engineering Department, Univ. of Bath, UK Prof. C.R. Burrows, Prof. K. A. Edge		
24.	Sumitomo Eaton Hydraulics Co., (SEHYCO), Kameoka, Japan. Mr. Y. Ashida, President		
25.	Fluid Power Laboratory, Mech. Engg. Dept. Yokohama National University, Japan. Prof. A. Yamaguchi	To see the laboratories and R&D Sections and to discuss about research/teaching activities, curricula, collaborative work etc.	During Stay in SEHYCO, Japan Arranged by host Industry.
26.	Research Centre for Bio-Medical and Mech. Engg. Depts. Kyoto Univ., Japan.		
27.	Dept. of Mechanical and System Engg. Kyoto Institute of Technology, Japan., Prof. I. Moriwaki		
28.	Power Transmission and Control Group, Sumitomo Heavy Industries, Ohbu-city, Japan.		
29.	Institute for off-road vehicles (CEMOTOR), Ferrara, Italy.		
30.	Institute for Fluid Power transmission and Control (IFAS), (RWTH), Aachen, Germany. Univ. Prof. Dr.-Ing. H. Murrenhoff (Director): Prof. Emeritus Dr.-Ing. W. Bache (Ex-Director)		Aug 27-Sept 05 1995
Note: In most of the Institutes/ Organization I delivered lectures/had discussions on Mechanical Power Transmission, Gearing, Fluid Drive and Control and related topics.			

Participation in International Conference/Symposium/Congress Abroad:

Sl. No.	Name of the Conference/Symposium etc.	Place	Dates	Purpose
1.	14 th . Scandinavian International Conference on Fluid Power, SICFP15.	Tampere, Finland	20-22 May, 2015	To present a paper.
2.	International Gear Conference 2014.	Lyon, France.	26-28 August, 2014	To present a papers and to chair a session
3.	The ASME 2011 International Design Engineering Technical Conferences (IDETC) (11 th . International Power Transmission and Gearing Conference)	Washington DC, USA	August 28-31, 2011	To present a paper
4.	20 th . International Conference on Hydraulics and Pneumatics (IHP-08)	Prague, Czech Republic	September 29- October 01, 2008	To present two papers and to chair a session
5.	3 rd . FPNI PhD Conference on Fluid Power	Terrassa, Spain	June 30-July 02, 2004	Invited Lecture, Chairing sessions/meeting
6.	4 th . International Fluid Power Conference	Dresden, Germany	March 24-26, 2004	Guest Participant, Chaired a session.
7.	5 th . International JFPS (Japanese Fluid Power System Society) Symposium on Fluid Power.	Nara, Japan	Nov. 12-15, 2002	To present two papers and to chair a session
8.	ASME International DET Conference, (DETC-2000) (8 th . International Power Transmission and Gearing Conference and 26 th . Design Automation Conference.)	Baltimore, USA	Sept.10-13, 2000	To present two papers
9.	10 th . Workshop on Power Transmission and Motion Control (PTMC '98).	Centre for PTMC, Univ. of Bath, UK.	Sept.12-14, 1998	Delegate sponsored by The Royal Society, UK
10.	3 rd . Intl JHPS (Now JFPS) Symposium on Fluid Power.	Yokohama, Japan	Nov.4-6, 1996	To present a paper
11.	IFTOMM 9 th . World Congress- Machines & Mechanisms,	Milan, Italy	Aug.29-Sep.2, '95	

Major Sponsored Research and Consultancy job Undertaken:

Sl. No.	Title of Project	Sponsored/Organization & IIT_SRIC Reference	Role	Duration/ Status/ Completed
1.	Approval of design & material selection for Winch Gear Box of High Mast Lighting Post (DMSM).	Chandra Gears Co., Kolkata.	PI	Jun 2015
2.	Design of a Harmonic Drive for Transmission Ratio 1:83 (FS Output, CS Fixed)	Magtorq Pvt Ltd, India.	PI	Jun 2014
3.	Design, Development and Performance Study of a New Concept HARMONIC Drive	DST (SERC), Govt. of India IT/SRIC/ME/02-03/45(CHD)	PI	Jul 2002 Dec 2006.
4.	PC Based Intelligent Drive & Control of a Proportional Solenoid Pressure Relief Valve for Energy Saving HST.	MHRD (R&D), Govt. of India IT/SRIC/ME/00-01/12(PCB)	PI	May 2000 Apr 2003
5.	Investigation on the Fixing Problems of Modular Screen Panel.	Industrial Consultancy IIT/SRIC/ME/99-00/79	PI	Completed During 1995 to 2000
6.	Tribology of Slipper Pad on Swash Plate.	CSIR 9/81(315)/98-EMR-I-KCS Govt. of India.	PI	
7.	Failure Analysis of gears of a Gear unit of Cooling Tower.	Industrial Consultancy IIT/SRIC/ME/99-00/....	CI	
8.	Checking of Design of Luff Drive System of ELL Wharf Cranes- Kantala Port Trust Project.	Industrial Consultancy IIT/SRIC/ME/97-98/95	CI	
9.	Development of Crack on the Welds between Trunion Flange and Dished End for Ball Mill in Malaysia and India.	Industrial Consultancy IIT/SRIC/ME/97-98/69	CI	
10.	Independent Design Verification of a Slow Mill.	Industrial Consultancy SRIC/94-95/ME/C-1/16	CI	

[PI:- Principal Investigator, CI:- Co-Investigator]