

## Curriculum Vitae

**Dr. PARTHASARATHI GHOSH**

### Mailing Address

Cryogenic Engineering Centre  
Indian Institute of Technology, Kharagpur  
Kharagpur 721302 India  
Tel: (03222)-283594; Fax: (03222) 282258

E-mail : [psghosh@hijli.iitkgp.ernet.in](mailto:psghosh@hijli.iitkgp.ernet.in);  
[partha\\_s2000@yahoo.com](mailto:partha_s2000@yahoo.com);  
[s.partha.ghosh@gmail.com](mailto:s.partha.ghosh@gmail.com)

### Educational Qualification:

Degree/ Examination	University/ Institution	Year	Specialization	Division
Ph. D.	I. I. T., Kharagpur	2002	Cryogenic Engineering	-
M. Tech.	I. I. T., Kharagpur	1995	Cryogenic Engineering	-
B. E.	South Gujarat University (SVR E C., now SVNIT Surat)	1992	Mechanical Engineering	1 <sup>st</sup> (distinction)
Higher Secondary	West Bengal Council for Higher Secondary Education	1988	Higher Secondary	1st
High School	West Bengal Board of Secondary Education	1986	Secondary	1st

### Ph. D Research Problem:

#### *Analytical and Experimental Studies on Cryogenic Turboexpander*

A turboexpander for small scale air separation has been designed, fabricated and tested along with investigation of performance using meanline analysis. The turbine has been analyzed for centrifugal stress. A design methodology has been prescribed for cryogenic turboexpander.

### **Professional experience**

<b>Company / organisation</b>	<b>Duration</b>	<b>Post</b>
CAT (Now RRCAT), Indore (DAE, Govt. of India)	October 2000- December 2001	K. S. Krishnan Research Associate
CAT( Now RRCAT), Indore (DAE, Govt. of India)	January 2002 – August 2006	Scientific Officer
IIT, Kharagpur	August 2006 – June 2013	Assistant Professor, Cryogenic Engineering
IIT, Kharagpur	June 2013 – till date	Associate Professor, Cryogenic Engineering

### **Achievements at CAT, Indore, Department of Atomic Energy**

1. Development of Cryogenic Reciprocating Expansion Engine: Cryogenic reciprocating engine has been success fully developed with thorough characterization. Maximum efficiency of 65% has been attained.
2. Development of 15 l/hr Helium Liquefier based on Claude Cycle. During my tenure at RRCAT 14 K no load temperature has been achieved.

The above machine is reported to achieve a production rate@15 l/hr.

### **Expertise**

1. Modelling and simulation of cryogenic refrigeration and liquefaction systems
2. Large scale helium cryogenics
3. CFD of cryogenic fluid transfer systems
4. Cryogenic rotating turboexpander, pump and other rotating equipment
5. Design and development of low temperature processes and equipment

### **Subjects taught at IIT Kharagpur**

1. Introduction to Cryogenic Engineering (**U G students**)
2. Design of Cryogenic Equipment and Accessories (**P G students**)

### **B. Tech Guidance**

2 completed

### **M.S. (By Research) Guidance**

1 (Completed)

### **M. Tech Guidance**

10 (Completed); 2 (ongoing)

### **Ph. D Guidance**

2 completed, 3 (ongoing)

### **Organisation of Short Term Course**

1. **Principal coordinator:** “Cryogenic Technology: Materials, Processes and Equipment”  
February 17-21, 2014, IIT Kharagpur
2. **Principal coordinator** of GIAN course “Cryogenic Technology: Materials, Processes and Equipment” June 27- July 08, 2016, IIT Kharagpur

### **Involvement in Sponsored Research Projects**

1. **Principal Investigator (PI) :** Studies on Gas Bearings for Cryogenic Turboexpanders (ISIRD, IIT Kharagpur)
2. **Principal Investigator (PI) :** Thermohydraulic simulation of LOX booster turbopump (LPSC, ISRO)
3. **Co-Principal Investigator (Co-PI):** Steady State and Dynamic Simulation of kW Class Helium Refrigerator/Liquefier for Superconducting Magnets Used for Fusion Machines. (NFP BRFS, IPR, Gandhinagar.)

### **Involvement in Consultancy Projects**

1. As PI: Performance Testing of Cryochamber and Soaking Chamber for cryotreatment of materials (SINTL Cryo)
2. As PI: The Process Design of Helium Liquefier for 50 Litre/Hr Helium Plant Development at VECC Kolkata , DAE Govt. of India
3. As Co-PI: The Heat Exchanger Design for Helium Liquefier (for 50 Litre/Hr Helium Plant Development) at VECC Kolkata DAE Govt. of India

### **Awards and Prizes:**

- Best Student speaker award at the Sixteenth National Symposium on Cryogenics (SNSC-97), 1997 held at IIT, Kharagpur
- KS Krishnan Research Fellowship, DAE-BRNS, Govt. of India, 2000-2001
- Outstanding Reviewer of Cryogenics Journal (Elsevier) for the year 2015

## List of Publication

### International Conference

1. **Sam, A. A., and Ghosh, P.,** (2016), “Helium Turboexpander for Cryogenic Refrigeration and Liquefaction Cycles: Transient Analysis of Rotor – Stator Interaction”, GT2016-56793, ASME TURBO EXPO, June 13-17, Seoul, South Korea. (Accepted).
2. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury,** “*Exergy analysis of large scale helium liquefies: evaluating design trade-offs*”, Advances in Cryogenic Engineering Vol 59A, AIP Conference Proceedings of the CEC/ICMC 2013, pp. 968 -975.
3. **Arpan Kundu, Rijo J Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury,** “*Evaluation of Optimum Design Parameters for Refrigerator-Liquefier Mixed Mode Operation and its Comparison with Liquefier mode using Collins Cycle*”, Proceedings of IIR Conference Cryogenics 2012, Dresden, Germany, September 10-14, 2012, pp. 233-235.
4. **Neville Rebelo and Parthasarathi Ghosh,** “*Numerical simulation of mixed convection heat transfer to forced flow supercritical helium*”, Proceedings of IIR Conference Cryogenics 2012, Dresden, Germany, September 10-14, 2012, pp. 199-205.
5. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury,** “*Performance of large-scale helium refrigerators subjected to pulsed heat load from fusion devices*”, Paper presented at ICEC 24, Fukuoka Japan, May 14-18, 2012, pp. 625-628.
6. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury,** “*Thermodynamic Analysis of Collin’s Cycle: Aspects of Designing Large Scale Helium Liquefier*”, Proceedings for ICEC 23, Wroclaw, July 19-21, 2010, pp. 291-297.
7. **Parthasarathi Ghosh, Bhaskar Rahul Nandi and Sunil Sarangi,** “*Prediction on Performance of Cryogenic Turboexpander Using Meanline Approach*”, Proceedings of ICEC 23, Wroclaw, July 19-21, 2010 , pp. 977-984.
8. **V. John Fernandez, Parthasarathi Ghosh and Darryl James,** “*Thermodynamics of Compact Downhole Turbo Generators*”, Paper No. SPE 116777, Proceedings of SPE Annual Technical Conference and Exhibition, Denver, Colorado, USA, September 21-24, 2008.
9. **Parthasarathi Ghosh and Sunil Kumar Sarangi,** “*Analysis of Centrifugal Stresses in the Rotor of a Cryogenic Turboexpander*”, Proceedings of ICEC 20, 20<sup>th</sup> International Cryogenic Engineering Conference, Beijing China, 2004.

10. **Sen, P., Ghosh, P., Sahoo, D. J., Vamsi Krishna K and Sarangi, S.**, “*An Improved Computer Program for Design of Cryogenic Expansion Turbine*”, Refrigeration Science and Technology Proceedings of the Eighth Cryogenics IIR International Conference, Prague, 2004.
11. **Parthasarathi Ghosh and Sunil Kumar Sarangi**, “*Static Stress Analysis of a Cryogenic Turboexpander Using Finite Element Method*”, Proceedings of ICEC 18 (Mumbai), Narosa Publication, 2000.
12. **Parthasarathi Ghosh and Sunil Kumar Sarangi**, “*Prediction Of Off-Design Performance Of A Cryogenic Turboexpander Using A Meanline Calculation Procedure*”, Proceedings of ICEC 18(Mumbai) Narosa Publication, 2000.
13. **Sen, P., Ghosh, P. and Sarangi, S.**, “*CRESP-TURBO: A Software for Design of Cryogenic Expansion Turbines*”, Proceedings of ICEC 18 (Mumbai) Narosa Publication, 2000.

**Journal Papers: International**

14. **Sam, A. A., and Ghosh, P.**, (2015), “Influence of thermophysical properties of working fluid on the design of cryogenic turboexpanders using  $n_s d_s$  diagram”, IOP Conference Series: Materials Science and Engineering 101, 012179.
15. **Mishra, A., and Ghosh, P.**, (2015), “Predicting performance of axial pump inducer of LOX booster turbo-pump of staged combustion cycle based rocket engine using CFD”, IOP Conference Series: Materials Science and Engineering 101, 012180.
16. **Kochunni, S. K., Ghosh, P., and Chowdhury, K.**, (2015), “Optimization of UA of heat exchangers and BOG compressor exit pressure of LNG boil-off gas reliquefaction system using exergy analysis”, IOP Conference Series: Materials Science and Engineering 101, 012090.
17. **Rahul Verma, Ashish Alex Sam and Parthasarathi Ghosh** “*CFD analysis of turboexpander for cryogenic refrigeration and liquefaction cycles*”, Published in Proceedings of the 25th International Cryogenic Engineering Conference and International Cryogenic Materials Conference 2014, Physics Procedia, Volume 67, pp. 373–378, 2015. (doi:10.1016/j.phpro.2015.06.043).
18. **Neville Rebelo and Parthasarathi Ghosh**, Pressure drop studies on supercritical helium flowing in horizontal tubes, *Journal of Thermal Science and Engineering Applications*, doi:10.1115/1.4030794, 2015.
19. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**, Identification of critical equipment and determination of operational limits in helium refrigerators under pulsed heat load, *Cryogenic*, Volume 59, pp. 23–37, 2014.

20. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Optimum number of stages and intermediate pressure level for highest exergy efficiency in large helium liquefiers, *International Journal of Refrigeration*, Volume 36, Issue 8, pp. 2438–2457, 2013.
21. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**, A cycle configuration for large scale helium refrigerator for fusion devices towards complete mitigation of the effects of pulsed heat load, *Fusion Engineering and Design*, Vol. 88, Issue 11, pp. 2972–2982, 2013.
22. **Rahul Bhaskar, Nandi, Parthasarathi Ghosh**, Centrifugal stress analysis on small cryogenic turboexpander, *International Journal of Mechanical Engineering and Research*. 03/2012; 1(1-ISSN: 2277-8128):29-33.
23. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**, Mitigation of Effects of Pulsed Heat Load from Fusion Devices on Helium Refrigerator: A Novel Technique using Vapor Compression Cycle, *International Journal of Refrigeration*, Volume 36, Issue 6, pp. 1776–1789, 2013.
24. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**, Mitigation of effects of pulsed heat loads in helium refrigerators for fusion devices using supercritical helium storage, *IEEE Transaction on Applied Superconductivity*, 22(6), 2012.
25. **Rijo Jacob Thomas, Rohan Kumar Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**, Applicability of Simpler Equations of State for Modeling Helium Systems, *Cryogenics (Elsevier)*, Vol. 52 pp. 375- 381, 2012.
26. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Exergy based analysis on different expander arrangements in helium liquefiers, *International Journal of Refrigeration*, Vol. 3 (5), pp. 1188 -1199, June 2012.
27. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Exergy analysis of different cold end configurations for helium liquefiers , *ASME J. Thermal Sci. Eng. Appl.* DOI: 10.1115/1.4005730, 2012.
28. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Role of heat exchangers in helium liquefaction cycles: Simulation studies using Collins cycle, *Fusion Engineering and Design Journal*, Volume 87, Issue 1, pp. 39–46, 2012.
29. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Application of exergy analysis in designing helium liquefiers, *Energy*, 37, 207-219, 2012.
30. **Rohan Dutta, Parthasarathi Ghosh and Kanchan Chowdhury**, Application of parallel heat exchangers in helium refrigerators for mitigating effects of pulsed load from fusion devices, *Fusion Engineering and Design* 86, pp. 296-306, 2011.

31. **Rohan Dutta, Parthasarathi Ghosh and Kanchan Chowdhury**, Validation and Customization of Aspen Hysys® for Dynamic Simulation of Helium Liquefier/Refrigerator Systems, *Energy* 36, pp. 3204-3214, 2011.
32. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Role of Expanders in Helium Liquefaction Cycles Parametric Studies Using Collins Cycle , *Fusion Engineering and Design Journal* 86, pp. 318- 324, 2011.
33. **Rijo Jacob Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Exergy Analysis of Helium Liquefaction Systems Based on Modified Claude Cycle with Two-Expanders , *Cryogenics Journal-ACASC 2009 Special Issue*, 51, pp 287-294, 2011.

### **National Journals**

34. **Rohan Dutta, Soumyarup Roy, Parthasarathi Ghosh, and Kanchan Chowdhury.** *Evaluation of a technique to mitigate effects of pulsed heat load of fusion devices on helium refrigerator.* Published in Indian Journal of Cryogenics Volume 39, pp 1-7, 2015.
35. **Rahul Verma, Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury.** Analysis of various liquid nitrogen pre-cooling schemes for large-scale helium liquefiers/refrigerators. Published in Indian Journal of Cryogenics Volume 40, pp 81-86, 2015. (doi:10.5958/2349-2120.2015.00014.X)
36. **Rijo Jacob Thomas, Sanjay Basak, Parthasarathi Ghosh, and Kanchan Chowdhury,** Helium Liquefaction/Refrigeration System Based on Claude Cycle: A Parametric Study, *Indian Journal of Cryogenics*, Vol. 34, No. 1-4, pp. 33-38, 2009.
37. **Rijo Jacob Thomas, Parthasarathi Ghosh, Kanchan Chowdhury and B. Sarkar,** Large-scale Helium Liquefier/Refrigerator for Fusion Devices: A Global Review and Indian Perspective Planning, *Indian Journal of Cryogenics*, Vol. 35, No. 1-4, pp. 321-326, 2010.
38. **Rijo Jacob Thomas, Sanjay Basak, Parthasarathi Ghosh, and Kanchan Chowdhury,** Thermodynamic Properties of Helium: A Comparative Study on Different Equations of State, *Indian Journal of Cryogenics*, Vol. 35, No. 1-4, pp. 240-245, 2010.
39. **Ashok K. Dewangan, and Parthasarathi Ghosh,** An Experimental Setup for Thermodynamic and Rotordynamic Performance Study of Cryogenic Turboexpander, *Indian Journal of Cryogenics Special Issue*, 35A, pp. 442-447, 2010.
40. **Parthasarathi Ghosh, Rijo Jacob Thomas, Rohan Dutta and Kanchan Chowdhury,** Design and Analysis of Large-scale Helium Liquefiers/Refrigerators: Issues

with Modeling and Simulation, *Indian Journal of Cryogenics*, Special Issue, 23rd National Symposium on Cryogenics (NSC 23), NIT Rourkela, India, Oct 28-30, 2010, pp. 9-16.

41. **Rohan Dutta, Rijo J Thomas, Parthasarathi Ghosh, and Kanchan Chowdhury**, Dynamic simulation of large-scale helium liquefier using Aspen Hysys®: Problems, solutions and prospect, *23rd National Symposium on Cryogenics, NIT Rourkela, India, October 28-30, 2010*.

#### **National Conference**

42. **Arpit Mishra and Parthasarathi Ghosh**. CFD analysis of axial pump of LOX booster turbopump for a staged combustion cycle based rocket engine. *25th National Symposium on Cryogenics, University of Hyderabad, India, December 8 – 10, 2014*.
43. **Thara Reshma I.V, Arpit Mishra, K N Jayachandran and Parthasarathi Ghosh**. CFD analysis of turbine nozzle set for booster turbo-pump system. *25th National Symposium on Cryogenics, University of Hyderabad, India, December 8 – 10, 2014*.
44. **Ashish Alex Sam and Parthasarathi Ghosh**. Performance validation of a small scale helium turboexpander for cryogenic applications through CFD analysis. *25th National Symposium on Cryogenics, University of Hyderabad, India, December 8 – 10, 2014*.
45. **Neville Rebelo and Parthasarathi Ghosh**. Pressure drop studies on supercritical helium flowing in horizontal tubes; *Proceedings of 22<sup>th</sup> National and 11<sup>th</sup> International ISHMT-ASME Heat and Mass Transfer Conference December 28-31, 2013, IIT Kharagpur, India*.
46. **Rohan Dutta, Rijo Jacob Thomas, Parthasarathi Ghosh and Kanchan Chowdhury**. Designing process plant with pulsating loads: Exergy analysis of helium plants for fusion reactors. Presented in National Conference on Energy Engineering, Analysis, Audit and Management, NIT Agarpara, Kolkata, India, July 8-10, 2013.
47. **Rohan Dutta, Parthasarathi Ghosh, and Kanchan Chowdhury**. Mitigation of effects of pulsed heat load to helium refrigerator in fusion devices: use of a cold-compressor. *Presented in 24th National Symposium on Cryogenics, IPR, Gandhinagar, January, 2013*.
48. **Kush, P. K., Ghosh, P., Ghosh, R., Sharma R., C., and Doohan R. S**. Test results of Cryogenic Reciprocating-type Expansion Engine using Nitrogen as Process Gas In: *Proceedings of National Seminar and Conference on Cryogenics and Its Frontier Applications* B. E. College, Sibpur, Howrah, India, 18-24, 2004.
49. **Parthasarathi Ghosh and Sunil Kumar Sarangi**. Development of a Cryogenic Turboexpander: Problems and Prospects *Proceedings of the Sixteenth National Symposium on Cryogenics, IIT Kharagpur, 1997*.



## **Other Professional Activities**

1. **International Thermonuclear Experimental Reactor, ITER** is an international collaborative effort among European Union, USA, China, Japan, India, Russia and South Korea for building Tokamak based Fusion reactor for future clean energy generation. ITER-India is the domestic agency that has been formed with the responsibility to provide to ITER the Indian contribution. The deliverables from ITER-India for ITER cryogenics systems are cryodistribution systems and cryolines.

*I have served in the capacity of expert member of the following review committees of ITER and ITER-India.*

- Design Review Committee for Torus cryostat and Cryoline of ITER, Cadarache, France
- Design Review Committee meeting of Cryodistribution of ITER Cadarache, France
- Design Review Committee of Cold Rotating machines ITER INDIA, Gandhinagar
- Expert member of Review Committee of Prototype Cryoline of ITER India
- Member of review panel of PDR of Y group of cryolines

2. Chairing sessions:

- (i) ICEC 26 – ICMC 2016 held at New Delhi
- (ii) CEC- ICMC 2015, held at Tucson Arizona (An oral and a poster session)
- (iii) ICEC 23 - ICMC 2010 (Oral Session) at Wroclaw, Poland 2010
- (iv) National Symposium on Cryogenics 25 (oral session), IPR Ahmedabad, India

3. Reviewer of National and International Journals

## **Major administrative responsibilities**

1. Head, Cryogenic Engineering Centre, IIT Kharagpur (From January 2016 till date)
2. Co-Professor In Charge , Refrigeration and Air-conditioning Unit, IIT Kharagpur

**Dr.ParthasarathiGhosh**