March 2018

CURRICULUM VITAE
of
DR. DIPAK MAZUMDAR

Ministry of Steel Chair Professor
Department of Materials Science & Engineering
Indian Institute of Technology
Kanpur, 208016 (INDIA)

Professor Dipak Mazumdar graduated in Metallurgical Engineering from Regional Institute of Technology, Jamshedpur (now an NIT) in 1980. Subsequently, in 1982, he obtained Master degree from Indian Institute of Technology, Kanpur and Ph.D. in Process Metallurgy in 1985 with honours from McGill University, Montreal, Canada. Following his Ph.D. and Post Doctoral Research Associateship at McGill, *Dr. Mazumdar* returned to India during early 1987 and joined IIT Kanpur as Assistant Professor, where he rose to the position of Associate Professor in 1993 and to a full Professor in 1995. During the periods 1992-1994, 1998-1999 and 2006-2006, *Dr. Mazumdar* served as a Visiting Scientist and Professor at the McGill Metals Processing Centre, McGill University, Montreal and the Department of MSE, University of California, Berkeley. He has over one hundred forty publications to his credit and written two text books on, "Modelling of Steelmaking Processes (2009)" and a " A first course in Iron and steelmaking (2015)".

Numerous awards and accolades have been bestowed on Professor Mazumdar for his seminal contributions to steelmaking research and education. These include, Kamani Gold Medal of IIM (1990), International Scientific Exchange Award from NSERC, Canada (1992), Metallurgists of the Year Award (2000) from the Ministry of Steel, Govt. of India, SAIL Gold Medal (2001) from the Indian Institute of Metals, the GD Birla Gold Medal of the Indian Institute of Metals (2009) and the coveted INAE Chair Professorship in 2011. He is a Fellow of The Indian National Academy of Engineering & The Indian Institute of Metals. Prof. Mazumdar is also on the Editorial Board of the Materials & Metallurgical Transactions B and Transactions of the Indian Institute of Metals. He has collaborated extensively with the domestic steel industries during the past decade. The 2012 SAIL gold medal of the Indian Institute of Metals, which he has received recently is the result of his collaborative research work with many steel industries in the country, leading to an annual yield improvement from tundish to the tune of ~500 crores INR. For his pioneering contribution to the domestic steel production sector, he has been awarded the Vasvik Industrial Research Award in 2010. Professor Mazumdar currently holds the "Ministry of Steel Chair" at IIT Kanpur and has been a recipient of the " Distinguished Industry Professorship-2013" from the Indian National Academy of Engineering. More recently, Prof. Mazumdar received the IIM Distinguished Educator Award from the Indian Institute of Metals (2014) as well as the Outstanding Teacher Award (2015) from INAE for his sustained contribution to ethics, teaching and research. He is an internationally recognised personality in the area of steel education and research.

Name: Dipak Mazumdar

Date of birth: February 9th,1958

Place of birth: Dhubri, Assam(India)

Present position: Ministry of Steel Chair Professor,
Department of Materials &
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Educational qualifications:

Year	Institution/University	Degree	Rank
1980	Regional Institute of Technology, Jamshedpur	B.Sc.Engg.(Metallurgy)	1st in Ranchi University
1982	Indian Institute of Technology, Kanpur	M.Tech.(Metallurgy)	1st in a class of 25
1985	McGill University, Montreal,Canada	Ph.D.(Metallurgy)	Dean's Honour

Area of specialisation: Steelmaking; Physical and mathematical modelling of metals and materials processing operations.

Previous positions:

(i) Post-Doctoral Research Associate in the Department of Mining &Metallurgical Engineering, McGill University, Montreal, Canada (1985-1986).

(ii) Assistant Professor in the Department of Metallurgical Engineering, I.I.T, Kanpur, India (1987-1992).

(iii) Visiting Scholar, McGill Metals Processing Centre, McGill University, Montreal, Canada (1992-94)

(iv) Associate Professor in the Department of Materials and Metallurgical Engineering, IIT, Kanpur (1993-1995)

(v) Visiting Professor, McGill Metals Processing Centre, McGill University, Montreal, Canada (1998-99)

(vi) Visiting Scientist, Department of Materials Sc. And Engg., University of California, Berkeley, 94720, USA (May-July, 2001)

(vi) Visiting Scientist, Department of Materials Sc. And Engg., University of California, Berkeley, 94720, USA (May-July, 2003)

(vi) PE Hearst International Scholar, Department of Materials Sc. and Engg., University of California, Berkeley, 94720, USA (July2006-June 2007)

(vii) Chairperson, Department of Materials Sc. and Engg., IIT Kanpur (Jan.2009-Dec.2011)

Teaching experience: 1985-to date; at both under - graduate and post - graduate levels; the following subjects were taught by Prof.Mazumdar:

(i) Steelmaking

(ii) Heat and Mass Transfer

(iii) Computing Applications in Metallurgy

(iv) Metallurgical Kinetics

(v) Application of Transport Phenomena in Metals Processing#

(vi) Modelling of steelmaking processes#

(vii) Secondary steelmaking#

Developed by Professor Mazumdar

Professional awards:

(i) **Kamani Gold Medal** of the Indian Institute of Metals for best paper published in Transactions of IIM (1989)

(ii) **International Scientific Exchange Award** of NSERC, Canada (1992-1993)

(iii) Best oral presentation award in non-ferrous section of **the 49th Annual Technical Meeting** of the IIM (1995).

(i)**Metallurgists of the year award** by the Ministry of Steel and Mines, Govt of India (Nov.2000)
(v**) " SAIL Gold Medal"** from the Indian Institute of Metals for best paper published in Transactions of The Indian Institute of Metals (2001)
(vi) Best oral presentation award in "Modelling session" of **the 61st Annual Technical Meeting** of the IIM (2007).
(vii) **GD Birla Gold Medal** of the Indian Institute of Metals (2009)
(viii**) " SAIL Gold Medal"** of the Indian Institute of Metals for best paper published in Transactions of The Indian Institute of Metals (2012)
(ix) **Vasvik** Industrial Research Award (2013)
(x) IIM[1] **Distinguished Educator Award** (2014)
(xi) **INAE Outstanding Teacher Award** (2015)

Academic honours:

(i) Place in the **Dean's Honour List** for the entire Ph.D. programme of studies at McGill University (Fall 1985 graduation)
(ii) Member, **Editorial board of Materials and Metallurgical Transactions,** TMS, USA(2001-2015)
(iii) **Fellowship of the Indian National Academy of Engineering (INAE)** (2002)
(iv) **Editor of Transactions of the Indian Institute of Metals** (2003,2012,2015)
(v) Elected a **Fellow of the Indian Institute of Metals (IIM)** (2005)
(vi) **Indian National Academy of Engineering** (INAE) Chair Professorship (2011-2013)
(vii) **Ministry of Steel, GoI,** Chair Professorship (2012-2017)
(viii) **INAE** Distinguished Industry Professor (2013)
(ix) **4th COEST** (IIT-Bombay) Annual lecture (2016)
(x) **8th CNR RAO** Distinguished lecture series speaker (IIT Kanpur, 2017)

Post graduate research supervision:

(a). M.Tech

(i)**Devulapalli Balaji** (1989); Thesis topic:*" Mathematical modelling of combination blown steelmaking processes."*
(ii) **Amarendra Kumar Singh** (1990); Thesis topic:"*Mathematical modelling of thermal fields during heat treatment of steel"*
(iii) **Chaitanya Bhanu(1997**); Thesis topic: *"Hydrodynamic modelling of steelmaking tundish systems"*

[1] Indian Institute of Metals

(iv) **Rakesh Kumar (1997);** Thesis topic*:"Modelling of mixing and mass transfer phenomena in gas agitated reactors"* (Co-supervisor: Prof. B.Deo, Dept. of MME, IIT, Kanpur)
(v) **Asish Robert (1998);** Thesis topic*:"Mathematical Modelling of flow and Residence Time Distributions in different tundish designs"* .
(vi) **Kamalesh Mandal (1998);** Thesis topic: *"Physical and mathematical modelling of flow and mixing in CAS systems with large aspect ratio"*
(vii) **Binod Bihari Mahato (2001);** Thesis topic*:"Modelling of flow and mixing in gas stirred ladle under transient conditions"*
(viii) **Projit Mitra (2001);** Thesis topic:"*Mathematical Modelling of three dimensional turbulent flows in some steelmaking operations"*
(ix) **Santosh K Rout (2001);** Thesis topic: *"Modelling of steady and transient flows in gas stirred ladle systems "*
(x) **Jayanta Mandal (2003);** Thesis topic: *"Mixing times in ladles stirred with dual porous plugs"*
(xi) **D.Satish (2003);** Thesis topic: *"Flow , mixing and mass transfer in dual plug stirred ladles in the presence of an upper buoyant slag phase"*
(xii) **M. Madan (2004);** Thesis topic: *"Numerical simulation of flow phenomena in rotating viscometers "*
(xiii) **D.Chatterjee (2005):** Thesis topic " A computational and experimental study of fluid flow phenomena in a hollow jet Nozzle"
(xiv) **Sujoy Patil (2005):** Thesis topic " Mixing models for slag covered ladles"
(x) **Rajeev K Singh (2007):** Thesis topic "Mathematical Modeling of fluid flow, mixing and hydro0dynamic refractory wear in gas stirred ladles for different bottom designs"
(xi) **S.Anand (2008):** Thesis topic "Fluid flow and residence time distributions in two different slab casting tundish designs"
(xii) **A**. **Muthuchammy (2009):** Thesis topic " A thermo-chemical model for charge proportioning in an Energy optimizing Furnace"
(xiii) K. Rajasekar (2009): Thesis topic **"**Modeling of inclusion removal kinetics in steelmaking tundish"
(xiv) M.Peranandhanathan (2010) Thesis topic "Slag eye area: measurements and correlations".
(xv) Sumanta Bagui (2010): Thesis topic "The role of a near wall
dam on the metallurgical performance of slab caster tundish" .
(xvi) Ranjeet K.Singh (2010): Thesis topic" Measurements and modeling of heat flow in high temperature furnace and steelmaking reactors"
(xvii) Bapin K Rout (2011): Thesis topic " Physical modeling of transport processes in an Energy Optimizing Steelmaking furnace"

(xviii) Ishant Jain (2011): Thesis topic " Thermal modeling and measurements in high temperature steelmaking operations"
(xix) Anurag Nandwana: (2011) Thesis topic " Physical & mathematical modeling of fluid flow phenomena in slab casting mold of different section size (>1500mm)
(xx) Aniket Dutt (2012): Thesis topic "The role of tundish design on residence time distributions (RTD) and slag entrainment phenomena"
(xxi) SharvanaKumar R(2012): Thesis topic "Modeling and optimization of argon rinsing practice in ladle metallurgy steelmaking operations"
(xxii) K Murlikrishna(2012): Thesis topic " Physical modeling of grade intermixing phenomena in a four strand bloom casting tundish"
(xxiii) P.Dhandapani (2013): Thesis topic **"**Modeling and Optimization of slag eye area and mixing time in ladle metallurgy steelmaking"
(xxiv) Suvajit Choudhary (2014): Thesis topic:" Modeling of material and thermal mixing in steelmaking tundish systems"
(xxv) Goutam Mandal (2014): Thesis topic " Modelling and measurement of heat flow during solidification of metals and alloys"
(xxvi) Pari R (2014): Thesis topic: "Modeling and measurement of intermixing time in a slab casting tundish fitted with different flow control devices"
(xxvii) Soumava Chakraborty (2015): Thesis topic: "Modeling of solidification of large, round steel ingots and validation against industrial scale measurements"
(xxviii) Lipsa Das (2016): Thesis topic "Simultaneous teeming of two ladles into a launder, hydrodynamic, thermal and material mixing"
(xxix) Rishikesh Misrha (2016): Thesis topic: "Physical and Mathematical modeling of slag entrainment during drainage of steelmaking ladles"
(xxx) Rohan Sharma (2016): Thesis topic: " Transient, multi-phase modeling of tundish hydrodynamics during end of sequence casting operation"
(xxxi) Krshnavtar (2017): Thesis topic: "Mathematical modeling of grade intermixing phenomena in a four strand bloom casting tundish" (*Best Master Degree thesis award in Materials and Metallurgical Engineering , IIM , 2017*)

(b).Ph.D

(i)**Shiv Kumar Choudhary (1994):**Thesis topic:" *A study on fluid flow, heat transfer, morphology and macro segregation in*

continuous casting of steel" (Co-supervisor: Prof. A. Ghosh, Met.Engg.)
(ii) **Anil Kumar (2005)** Thesis topic: "*Physical and mathematical modelling of flow and Residence Time Distributions in a multi strand continuous casting tundish"* (Co-Supervisor: Prof. S.C.Koria)
(iii) **Prince K Singh(on going)** Thesis topic: " *Two-phase flows in ladle shrouds: Physical and mathematical modeling of liquid steel transfer from ladle to tundish via a shroud"*
(iv) **Suvam Mukherjee (on going)** Thesis topic : *"Modeling of liquid steel transfer operations and solidification during casting of large round ingots"*

Sponsored research:

(i) **MHRD** funded project for Rs.2.0 x 10^6 on *" Specialised training program on applied mathematical modelling and process simulation"*(1988-1991), (Co - investigators: Profs. B.Deo and N.Chakraborty)
(ii) **NMIS** funded project for Rs.1.2 x 10^6 on *"Some fundamental studies of continuous casting of steel"* (1989-1992) (Co - Investigators: Profs. A.Ghosh and S.C.Koria)
(iii) **RDCIS (SAIL)** funded sponsored project for Rs. 0.6 x 10^6 on *"Mathematical modelling of transport phenomena in steelmaking tundishes"* (1996-1998)
(iv) **Ministry of Steel** funded sponsored project for Rs.1 x 10^6 on *"Mixing and Mass transfer in Ladles stirred with dual porous plug"* (2001-2004)
(v) **Department of Science and Technology** , Govt of India funded sponsored project for Rs. 1.2x10^6 on *"Control of superheat in continuous casting through Hollow Jet Nozzle"* (2003-2006) .
(vi) **Department of Science and Technology** , Govt. of India funded sponsored project for Rs.2.8x10^6 on *"Measurement and modeling of temperature in steelmaking"* (2009-2011) .
(vii) **Ministry of Steel** , Govt. of India funded sponsored project for Rs. 6.187x10^6 on " *Setting up of a comprehensive water modeling laboratory for steelmaking process analysis and design*" (2011-2013)
(viii) **Ministry of Steel**, Govt. of India funded sponsored project for Rs. 2.0x10^6 titled " *A study on requirement and availability of technical manpower for steel industry in India (2014-2015)*"

Industry funded research:

(i)"**Dense phase powder injection in metallurgical reactors**" sponsored by Shawinigan carbide, Shawinigan, Canada, 1983

(ii)" **Physical and mathematical modelling of MINTEQ tundish designs"** sponsored by MINTEQ International Inc., Easton, PA, USA,1993

(iii) **"Modelling studies for ladle addition of ferroalloys"** sponsored by Elkem Development Centre, Pittsburgh, USA, 1993

(iv) **"Enhancing productivity at Ispat's Dolvi plant through improvement of tundish performance"** Sponsored by ISPAT Industries, Dolvi, Maharastra(India, Jan-April,2004)

(v) **"On the relocation of porous plugs in LF for superior process performance at Dolvi plant through physical and mathematical modelling"** Sponsored by ISPAT Industries, Dolvi, Maharastra (India, Oct.04- Jan, 2005)

(vi) **"Performance enhancement and optimisation of tank degasser"** at the Hospet Steels, Ginigera, Karnataka ,Sponsored by Mukand Ltd., Mumbai (Aug.,2005-Nov.,2005)

(vii) **"Enhancing productivity at Hospet steel plant through improvement in tundish design"** Sponsored by Mukand steel Hospet Karnataka, India, Feb-May, 2006.

(viii) "Improving yield and steel cleanliness in the 32T new tundish" Sponsored by JSW steel Ltd., Torangallu, (India, July-Sept., 2007)

(ix) "Improving yield from the 36T slab casting tundish at JSPL , Raigarh" Sponsored by JSPL, Raigarh(India, December, 2007 –March 2008).

(x) "A charge calculation model for increased throughput operation of the Energy Optimising Furnace (EOF) at Hospet Steel, Hospet" Sponsored by Hospet Steel., Hospet (India , September, 2008)

(xi) "Improving yield and steel cleanliness in the 27T four strand bloom casting tundish at RINL's Vizag steel works" Sponsored by Vishakhapattnam steel plant, Vishakhapattnam (India, August, 2008-January, 2009)

(xii) "Improving yield and steel cleanliness in the four strand combicaster tundish at JSPL, Raigarh" Sponsored by Jindal Steel and Power Limited, Raigarh (India, August, 2009-January, 2010)

(xiii) "Reduction in tap to tap time for EOF (Energy Optimizing Furnace Operations) at Hospet Steel" Sponsored by Hospet Steel., Hospet (India , January, 2010)

(xiv) "Defect free casting of larger section continuously cast slabs(>2500mm) at JSPL, Raigarh" Sponsored by Jindal Steel and Power Limited, Raigarh (India, November 2010)

(xv) "Minimisation of transition bloom volume from the 27T four strand bloom casting tundish at RINL, Vishakhapattnam" Sponsored by Vishakhapattnam steel plant, Vishakhapattnam (India, September 2011- January 2012)

(xvi) "Improving yield and steel cleanliness in the three strand T shaped tundish" Sponsored by MUSCO, Khopoli(India, October, 2011-March,2012)

(xvii) "Technical audit of ferroalloy production at CFP Chandrapur and possible means for plant performance enhancement" Sponsored by SAIL, Delhi (August –December 2014).

(xviii) " The origin of surface cracks in large round ingots and means for its elimination" Sponsored by Mahindra Sanyo Special Steel, Khopoli (September 2014- February 2015)

(xix) "**A study on the scope of in-situ conversion of scrap into steel sheet/strip via the induction melting-ingot casting and hot rolling route"** Sponsored by IFB Industries , Bangalore (February, 2015-May, 2015)

(xx)"Steelmaking process performance improvement and knowledge management" Sponsored by Vardhman Special Steels Limited, Ludhiana (April 2015-March 2016).

(xxi) "Perspex water models of industrial continuous casting tundish systems, water modeling and technical manpower training" Sponsored by Hi-Tech Group Limited, Jamshedpur (October 2015-September 2016).

(xxii) " Reduction of ladle balance and improvement of yield from the 140 ton steel at RINL's Vizag steel works" Sponsored by Vishakhapattnam Steel Plant (Feb.1st 2016-July 31st, 2016).

(xxiii) "An assessment of CONARC process performance and strategy for improved furnace performance" Sponsored by JSW, Dolvi (March-December 2017)

(xxiv) " **Modelling of steelmaking processes"** Sponsored by MN Dastur and Co., Kolkata (June 2017-May 2018).

Intensive/short-term courses:

(i)"**Secondary Steelmaking**" offered to industrial, academic & R & D engineers (Dec.1990 and Dec.1991) (Joint Convenor: Prof.A.Ghosh, Dept.of Met. Engg.,IIT/K)

(ii)"**Modelling of modern steelmaking processes**" offered to Industrial and R & D engineers (Jan.96 and Sept.97) (Joint Convenor:Prof.B.Deo, Dept. of MME, IIT/K)

(iii)"**Modelling in metals processing: concepts, theory and application"** offered to Industrial and R & D engineers (February 2005, December, 2005; December 2007;January,2009)

(iv) "**Iron and Steelmaking (Foundation and advanced level)**" offered to Engineers from steel and refractory industries (May, June 2009; May 2010, May 2011)

(v)"**EAF and Secondary Steelmaking**" offered to Engineers from Steel and Refractory Industries (August 2008 and September 2011)

(vi)"**Tundish Metallurgy: Towards improved productivity and clean steel**" offered to Engineers from steel and refractory industries (September 2012; August 2013)

(vii)"**Ladle Metallurgy Steelmaking: Towards better productivity and product quality**" offered to Engineers from steel and refractory industries (August 2014 and August 2015).

(viii)"**Inclusions in steel and clean steel technology**" offered to Engineers from steel and refractory industries (August 2016).

Patents:

A tundish adapted for reduction in residual metal losses and a method thereof
Application No: 1397/MUM/2008
Date of Application : 03.07.08
List of inventors: D Satish Kumar, **Dipak Mazumdar**, B.Reddi Prasad, Sujay Pandit Patil, Abijit Sarkar, P.C.Mahapatra & Madhu Ranjan

Professional body membership:

(i)Life Member of the **Indian Institute of Metals**
(ii)Member of the **Association of Iron and Steel technology (AIST)**
(iii)Member, Programme Advisory Committee**, Dept. of Science and Technology, Govt. of India,** (2012-2015, 2015-2018).
(iv) Member, Governing Council, **Indian National Academy of Engineering,** (2016-2017).
(v) Member, Board of Governors, **National Institute of Secondary Steel Technology, Ministry of Steel, Govt.of India,** (2015-2017).
(vi)Member, Education and Publication Committee**, Indian Institute of Metals,** (2010-2016).

Publication summary of Prof. Dipak Mazumdar):

H-Index=25: Total citations:2117 ; No. of Publication in refereed journals: One hundred (102) ; No. of Publication in Proceedings: Forty (46) (as on 1st January, 2017)

(i) Video lectures/courses:
(National Programme on Technology Enhanced Learning (NPTEL))

1. D.Mazumdar and SC Koria: Steelmaking, http://nptel.ac.in/syllabus/113104013/

(ii) Books:

1.P.Assis, B.Deo, D.Mazumdar and N.Chakraborty: **Modelling and Simulation of Iron and Steelmaking**, Revista Escola de Minas, Ouro Preto, Brazil,1998.

2. D.Mazumdar and J.W.Evans: **Modeling of Steelmaking Processes**, CRC Press, Boca Raton, Florida, USA ,2009.

3. D.Mazumdar: **A First Course in Iron and Steelmaking,** Universities Press, Hyderabad, 2015.

(iii) Solution manual:

1. D.Mazumdar and J.W.Evans: **Solution manual for Modeling of Steelmaking Processes**, CRC Press, Boca Raton, Florida, USA ,2009.

(iv) Book chapters:

1.Dipak Mazumdar: Modelling of secondary steel making processes, in " **Secondary steelmaking** " by A.Ghosh, CRC Press, 2000, pp.199-217.

(v) Publications in referred journals:

1. Dipak Mazumdar and Ahindra Ghosh: *Production of semi-killed steel with optimum porosity, Part II: Experimental measurements,* Trans.I.I.M., Vol.38(1),1985, pp.55-63.

2.Dipak Mazumdar and R.I.L.Guthrie: *Hydrodynamic modelling of some gas injection operations in ladle metallurgy operations*, Metall.Trans., Vol.16B,1985,pp.83-90.

3.Dipak Mazumdar and R.I.L.Guthrie: *The hydrodynamics of the C.A.S.method of alloy addition,* Ironmaking and Steelmaking, Vol.12(6),1985,pp.256-264.

4.Dipak Mazumdar and R.I.L.Guthrie: *Numerical computation of flow and mixing in ladle metallurgy steelmaking operations (the C.A.S.method),* Applied Mathematical Modelling, Vol.10(1),1986,pp.25-32.

5.Dipak Mazumdar and R.I.L.Guthrie: *On the reduction in steady translational drag forces in bubbly Newtonian liquid,* Chemical Engineering Science, Vol.41(11), 1986, pp.2965-2967.

6.Dipak Mazumdar and R.I.L.Guthrie: *Mixing models for gas stirred ladle systems,* Metall.Trans., Vol.17B, 1986,pp.725-733.

7.H.Nakajima, Dipak Mazumdar and R.I.L.Guthrie: *Effect of overlying slag phase liquids on the hydrodynamics of gas stirred ladle systems*,Tetsu-to-hagane, 1987, pp.S949.

8.Dipak Mazumdar and R.I.L.Guthrie: *An analysis of numerical methods for solving the particle trajectory equation,* Applied Mathematical Modelling, 1988, pp.398-401.

9.Dipak Mazumdar, H.Nakajima and R.I.L.Guthrie: *Possible roles of upper slag phases on the fluid dynamics of gas stirred ladles*, Metall.Trans., Vol.19B, 1988,pp.705-708.

10.Dipak Mazumdar and Ravi Verma: *A predictive mathematical model for analysis of continuous casting of steel,* Trans.I.I.M., Vol.42(5),1989, pp.447-*459* **(Trans. IIM best paper award**; **Kamani Gold Medal , 1989)**.

11. Dipak Mazumdar: *A consideration about the concept of effective thermal conductivity in continuous casting,* ISIJ International, Vol.29(6), 1989, pp.524-528.

12. Dipak Mazumdar: *On effective viscosity models for gas stirred ladle systems*, Metall.Trans, Vol.20B,1989, pp.967-969.

13. Dipak Mazumdar: *Dynamic similarity considerations in gas stirred ladle systems*, Metall.Trans., Vol. 21B,1990,pp.925-928.

14.Dipak Mazumdar and R.I.L.Guthrie*: Hydrodynamic modelling of slag - metal interactions in gas stirred ladle systems*,Trans.I.I.M, Vol.43(3), 1990, pp.139-148.

15.Dipak Mazumdar, S.K.Kajani and A.Ghosh: *Mass transfer between solid and liquid in vessels agitated by bubble plume,* Steel Research, Vol.61(8), 1990, pp.339-346.

16.Dipak Mazumdar and S.Ramani: *Computation of transient diffusion phenomena via FORTRAN library routines,* Trans. I.I.M., Vol.43(3), 1990, pp.183-186.

17. Dipak Mazumdar and R.I.L.Guthrie: *Hydrodynamic modelling of gas stirred ladle systems*, Trans.I.I.M., Vol.44(6), 1991,pp.139-149.

18.D.Balaji and Dipak Mazumdar: *Numerical computation of flow phenomena in gas stirred ladle systems*, Steel Research, Vol.62(1),1991, pp.16-23.

19.A.K.Singh and Dipak Mazumdar: *Comparison of several numerical prediction methods for thermal fields during phase transformation of plain carbon steel*, ISIJ International, Vol.3(12), 1991, pp.1441-1445.

20.Dipak Mazumdar, Neeraj Kumar and Vinaya Verma: *Heat and mass transfer rates between solid and liquid in gas stirred ladle systems,* Ironmaking and Steelmaking, Vol.19,1992, pp.152-155.

21.A.K.Singh and Dipak Mazumdar: *Mathematical modelling of thermal fields during heat treatment of steel,* Steel Research, Vol.63(5), 1992, pp.194-200.

22.Dipak Mazumdar, Tanuj Narayan and Paramjit Bansal: *Mathematical modelling of mass transfer rates between solid and liquid in high temperature gas stirred melts*, Applied

Mathematical Modeling, Vol.16(5),1992, pp.255-262.

23.D.Balaji and Dipak Mazumdar: *Mathematical modelling of flows induced by co-axial submerged and impinging gas jet systems*, Trans.I.I.M., Vol.45(1),1992, pp.25-32.

24.A.Bhattacharjee and Dipak Mazumdar: *Mathematical modelling of fluid flow, alloy dissolution and mixing in industrial argon stirred ladles*, Trans.I.I.M., Vol.45(3), 1992, pp.153-161.

25.G.G.Roy, V.Singh and Dipak Mazumdar: *Mathematical modelling of fluid flow in filling ladles,* Trans.I.I.M., Vol.45(3), 1992, pp.147-152.

26.Dipak Mazumdar, R.I.L.Guthrie and Y.Sahai: *On mathematical models and numerical solutions of gas stirred ladle systems,* Applied Mathematical Modelling, Vol.17(5), 1993, pp. 255-262.

27.M.Tanaka, Dipak Mazumdar and R.I.L.Guthrie: *Motions of alloying additions during furnace tapping in steelmaking processing operations*, Metall.Trans., Vol.24B, 1993, pp.639-648.

28.Dipak Mazumdar and R.I.L.Guthrie: *Motions of alloying additions in the C.A.S Steelmaking operations,* Metall.Trans., Vol.24B, 1993, pp.649-655.

29.Dipak Mazumdar and R.I.L.Guthrie: *Considerations concerning the numerical computation of mixing times in steelmaking ladles,* ISIJ International, Vol.33(4), 1993, pp.513-516.

30.Dipak Mazumdar and R.I.L.Guthrie: *On the numerical calculation and non-dimensional representation of velocity fields in bubble stirred ladle systems*, Steel Research, Vol.64(6), 1993, pp.286-291.

31.S.K.Choudhary, Dipak Mazumdar and A.Ghosh: *Mathematical modelling of heat transfer phenomena in continuous casting of steel,* ISIJ International, Vol.33(7),1993, pp.764-774.

32.Dipak Mazumdar: *On the mathematical approximation of infinitely long cylinders in rate phenomena,* Trans.I.I.M , Vol.46(6),1993,pp.387-390.

33.Dipak Mazumdar: *An improved quasi single phase calculation procedure for hydrodynamic modelling of gas stirred ladle system*, Trans.I.I.M.,Vol.46(6),1993,pp.353.362.

34.Dipak Mazumdar and R.I.L.Guthrie: *A comparison of three mathematical modelling procedures for simulation of fluid flow phenomena in bubble stirred ladle systems*, Metall.Trans., Vol.25B, 1994, pp.308-312.

35.Dipak Mazumdar and R.I.L.Guthrie: *An assessment of a two phase calculation procedure for hydrodynamic modelling of submerged gas injection in ladles,* ISIJ International, Vol.34(5), 1994,pp.384-392.

36.S.K.Choudhary and Dipak Mazumdar: *Mathematical modelling of transport phenomena in continuous casting of steel,* ISIJ International, Vol.34(7), 1994, pp.584-592.

37.Dipak Mazumdar and R.I.L.Guthrie: *The physical and mathematical modelling of gas stirred ladle systems ,* ISIJ International, Vol.35(1),1995,pp.1-20.

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Presentations and lectures:

(i) Special and Memorial lectures:

1.**G.D.Birla Gold Medal lecture (2009),** The Indian Institute of Metals, Kolkata, India, November 14th, 2009.

Title: "The knowledge based foundation of steelmaking and application in steel melt shop"

2. **4th Annual COEST Steel Colloquium lecture (2016) ,** Indian Institute of Technology, Mumbai.
Title: "Engineering in Steelmaking"

3. **8th CNR Rao Distinguished lecture (2017)**, Indian Institute of Technology, Kanpur.
Title: "Steelmaking:Challenges and opportunities"

(ii) Presentation in International conferences:

(1) (i)"The hydrodynamics of the C.A.S. alloy addition Procedure"
and
(ii) "Mixing rates for gas stirred ladles"
Canadian Annual Conference of Metallurgist, Vancouver (Canada), 1985.

(2) "Alloying in ladles with C.A.S"
Fifth International Iron and Steel Congress, Washington D.C.(USA), 1986.

(3) " On the applicability of effective thermal conductivity concept to the mathematical modelling of continuous casting of steel"
International Conference on Chemical Metallurgy, Bombay (India), 1991.

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QUACON'97, International Conference on Quality Challenges in Continuous Casting, Ranchi (India),1997.

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ICRAMP-97, International Conference on Recent Advances in Metallurgical Processes, Bangalore (India), 1997.

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Asia steel-2003 International conference, Jamshedpur, 2003

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(12) "Mixing times and correlation for dual plug stirred ladle: Quantifying the role of an upper buoyant phase", **Conference of Metallurgists (CIM, METSOC), Hamilton, Canada, 2004.**

(iii) Presentation in national conferences and workshops:

1) *"Fluid dynamics of slag-metal interaction in gas stirred ladle systems"*
Symposium on Kinetics of Metallurgical Processes, I.I.T.,Kharagpur (1987).

(2) *"Fluid dynamics of slag-metal interaction in gas stirred ladle systems"*
43rd **Annual Technical Meeting of I.I.M, Calcutta (1989)**.

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45th **Annual Technical Meeting of I.I.M, Ranchi (1991)**

(4)(i) *" Hydrodynamic performance of steelmaking tundish systems: A comparative study of three different tundish designs"*
and
(ii)"*Mathematical modelling of heat transfer and solidification phenomena in continuous casting of steel"*
48th **Annual Technical Meeting of I.I.M, Vishakhapatnam (1994)**.

(5)"*Modelling of solid liquid mass transfer rates in gas stirred metallurgical reactors "*
49th **Annual Technical Meeting of I.I.M, Calcutta (1995)** (**Best Presentation award**)

(6)"*Numerical prediction of melting rates in gas stirred ladle systems"*
50th **Annual Technical Meeting of I.I.M, New Delhi(1996)**.

(7) *"A computational and experimental study of Residence Time Distributions (RTD) in different tundish designs"*
54th **Annual technical Meeting of I.I.M, Bhilai(2000)**

(8) "*The role of modelling in steelmaking"*
Keynote presentation, 55th **Annual technical Meeting of I.I.M, Bhubaneswar(2001)**

(9) "*Mixing times and correlation for dual plug stirred ladle: Quantifying the role of an upper buoyant phase"*, 58th **Annual technical Meeting of I.I.M, Tiruvananthapuram(2004)**

(10) "*Some shop floor problems in steel plants and their solution through Process Engineering", 59*th **Annual technical Meeting of I.I.M, Chennai(2005)**

(11) " *Yield improvement in steel melt shop through reduction of tundish skull"* ,**61st Annual Technical Meeting, Indian Institute of Metals, Mumbai, 2007**

(12) *"Mathematical modeling of Post combustion in an Electric Arc furnace"* **,61st Annual Technical Meeting, Indian Institute of Metals, Mumbai, 2007** (co-author: Prof. A.S.Mujumdar, NUS, Singapore) **(Best presentation award, 2007)**

(iv) Invited/Keynote presentations:

(1) "*Mathematical modelling of turbulent fluid flow and solid liquid mass transfer rates in bubble stirred ladles"* (1993)
Department of Metallurgy and Materials Science, **Ohio State University, Columbus(USA)**

(2) "*Mathematical modelling of fluid flow and solid liquid mass transfer rates in bubble stirred ladles"* (1993)
Department of Metallurgical Engg. and Materials Science, **Pennsylvania State University, State College (USA)**

(3) "*On a solid –liquid mass transfer correlation*" (1994)
Henry Crumb School of Mines, Columbia University (USA).

(4) "*Mass transfer between solid and liquid in bubble stirred ladles*" (1994)
Department of Materials Science and Engineering, McMaster University, Hamilton (Canada)

(5)"*Mathematical modelling of flow and solid liquid mass transfer rates in gas stirred ladles"* (1995)
RDCIS(SAIL), Ranchi (India) .

(6) "*Modelling of solid liquid mass transfer rates in gas stirred metallurgical reactors* " (1996) , **National Metallurgical Laboratory, Jamshedpur(India)**

(7)"*Modelling of mixing phenomena in axisymmetric gas stirred ladle systems"* (1997)
Indian Institute of Science, Bangalore (India)

(8) "*Application of Process Engineering Fundamentals to Ladle metallurgy Steelmaking Operations*"(1999), **Department of Metallurgy and Materials Science , University of Toronto, Toronto (Canada)**

(9) *"The role of Physical and mathematical Modelling in Steelmaking"* (2002)
Durgapur Steel Plant, Durgapur, July 2002 (Host: IIM Durgapur Chapter),

(10) "*Modelling of some fundamental and applied problems in Iron and Steelmaking*" (2004)
Department of Mining and Metallurgy, McGill University, Montreal (Canada)

(11) *"Steel Research at IIT, Kanpur"* (2005)

National Metallurgical Laboratory , **Jamshedpur**

(12) *" Steelmaking, modelling and CFD: approach and efforts at IIT, Kanpur*" (2005) **2nd south East Asia users group meeting, FLUENT, Pune , India**

(13) "*Physical and mathematical modelling of two phase flows in a hollow jet nozzle"* **ICAMMP-2006**, Kharagpur (India).

(14) **"***Homogenization vs. Re-oxidation:an investigation of argon rinsing practice through modeling and optimization"* (2007) **JSW steel Limited, Torangallu.**

(15)"*Fundamental Process Engineering in Steelmaking: From Laboratory to Steel Melt Shop"* (2007), **61st Annual technical Meeting, Indian Institute of Metals, Mumbai.**

(16) "*Secondary Steelmaking and ladle metallurgy*", **Mahindra Ugine Steel Industries, Khopoli, Maharastra , 2009**

(17) "*Steelmaking technology"* ,National Workshop on **PROCESS MODELING IN IRON MAKING & STEEL MAKING,7-8, Surathkal , 2009**

(18) "*Physical and Mathematical Modeling : Fundamental Principles"*, National Workshop on **PROCESS MODELING IN IRON MAKING & STEEL MAKING,7-8, September, Surathkal, 2009**

(19)" P*hysical and Mathematical modeling: Applications to steelmaking process analysis and design",* National Workshop on **PROCESS MODELING IN IRON MAKING & STEEL MAKING, Surathkal, 7-8, September 2009**

(20) "*Modeling Energy Dissipation in Argon stirred ladles"*, **Advances in the Theory of Iron and Steelmaking (ATIS)**, Bangalore, India, 2009.

(21) "*Physical modeling of slab caster tundish to improve yield and quality of steel",* **Jim Evans Honorary Symposium, TMS2010**, Seattle.

(21) " *Modeling and optimization of steel processing in EOF, ladle and tundish : An overview of collaborative research at IIT Kanpur",* **Guthrie Honorary symposium, Montreal , Canada, 2011.**

(22)"Modeling and high temperature studies of continuous casting of wider section(1500~2500mm) steel slabs", **ATCOM 2011, Ranchi , India.**

(23) "*Academia, research and industry synergy: An overview of decade long steel industry funded research at IIT Kanpur"*, **ICAMMP-2011, Kharagpur**.

(24) "*The role of modeling in steelmaking"*, **IREFCON12, Kolkata.**

(25) " *Some considerations concerning thermal modeling during deformation and heat treatment processes",* **RAFTS-2012, Ranchi.**

(26) "*Tundish Metallurgy: towards better productivity and clean steel"*, **International symposium on challenges in steelmaking, Jamshedpur, 2012.**

(27) "*Modeling of steelmaking processes: Efforts at IIT Kanpur"*, **SIMPRO-2012, Ranchi.**

(28) "*Ladle metallurgy Steelmaking: The role of physical and mathematical modeling",* **Science and Technology of Iron and Steel**, **STIS13** , Jamshedpur, 2013 (Keynote)

(29) "*Metallurgical performance of slab casting tundish: Towards a generic tundish design"*, Advances in refractories and clean steel, **ARCS2013**,Ranchi .

30. "*Tundish process performance improvement: Some Indian case studies",* Procd. **Ralph Lloyd Harris Memorial Symposium, M&MT2013, Montreal .**

(31) "*Steelmaking: Theory, practice and plant performance*, **NMD-ATM 2013, Varanasi, 2013** (Keynote)

(32) "*Steelmaking: Theory, practice and plant performance"*, **ICS-2015**, Beijing,(Keynote)

(33) "*An experimental and computational analysis of casting of large round steel ingots"***, Asia Steel 2015,** Yokohoma, Japan (Keynote)

(34). D.Mazumdar: "*Challenges in casting of large round steel ingots: industrial scale simulation and measurements, Steel Tech International seminar on "Innovative technologies for clean, green and automated steel plants",* Invited presentation, Sept.2015, Kolkata

(35) " *R&D needs for special steel plants: the relevance of industry – academia interactions",* **7th special steel conventional, Steelworld**, Pune, Dec.19th, 2015 (Keynote).

(36) "*The Indian Iron and Steelmaking Scenario: A perspective on Future, Technical manpower and R&D"*, IREFCON-2016,Hyderabad.

(37) **"***The role of CFD in steelmaking: single and multi-phase modeling of argon-steel-slag interactions in ladle metallurgy and casting processes",* SIMPRO-2016, Ranchi.

(38) "*Direct measurements of thermal contact resistance during industrial scale, ingot casting operation*", STEELSIM2017 Conference, Qingdao, China, 2017.

CURRENT RESEARCH INTERESTS

(1) Enhancing steel mill process performance by integrating theory with practice.
(2) Mold design, heat flux measurement, powder entrapment during solidification of large round steel ingots.
(3) Side blowing reactors: reactive and non reactive gas injection.
(4) Superior gas injection technique for large scale dissolution of nitrogen during production of high nitrogen stainless steel.

(5) Turbulent, multi phase flow modelling in industrial steel processing units such as ladles, shrouds and tundishes[2].

PRIMARY INDUSTRIAL COLLABORATORS

Integrated steel plants	**Special steel plants**	**Refractory industries**	**Ferro-alloy industries**
Ispat Industries	Hospet Steels Limited, Ginigera, Karnataka	Hi Tech refractories, Jamshedpur	Chandrapura Ferroalloy Plant (SAIL), Chandrapura, Maharastra
Jindal South West Steels Limited	Mahindra Sanyo Special Steels Limited, Khopoli		
Jindal Steel and Power Limited	Vardhman Special Steels Limited, Ludhiana		
Rashtriya Ispat Nigam Limited			

[2] More information and further details are available on http://home.iitk.ac.in/~dipak **and** http://scholar.google.co.in/citations?user=a_qfewcAAAAJ