Curriculum Vitae – Rahul Kumar Soni

Url: https://www.immt.res.in/process-modeling-instrumentation/mr-rahul-kumar-soni-scientist
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Work experience

06 May, 2019 onwards: Senior Scientist in Process Modeling & Instrumentation Technology, CSIR-Institute of Minerals & Materials Technology in the area of applied modeling and simulation.

06 May, 2015 to 05 May 2019: Scientist in Process Modeling & Instrumentation Technology, CSIR-Institute of Minerals & Materials Technology in the area of applied modeling and simulation.

01 March, 2013 to 05 May, 2015: Worked as Scientist (Fellow) at CSIR–Institute of Minerals & Materials Technology for the period of 01-03-2013 to 19-12-2015 in the research area of modeling and simulation.

Broader Research interests

Improvement in equipment design with the help of coupled form of DEM, FEM, CFD and CFDEM coupling, Data Reconciliation, Modelling of direct reduction of iron ore.

Education

Qualification	Specialization	Institution	Year	Marks
Ph.D.	Chemical Engineering	IIT Bombay	4th year (pursuing)	-
Master of Technology	Mineral Resource Management	Indian Institute of Technology (IIT), Dhanbad	2012 (Dual Degree)	OGPA: 7.69 (Max-10.00 in absolute scale)
Bachelor of Technology	Mineral Engineering			
Higher Secondary (+2)	Science	Bharat Mata H. S. School, Bilaspur, India	2006	79.0%
High School	-		2004	76.0%

Technology Developed and disseminated

1. Developed JeevNasI: An electrostatic antiviral spray machine for COVID-19 and transferred technology to M/S SupplyZone, Noida and M/S DigiSharp, Nagpur for commercialization.
2. Developed novel design of agitators for stirred mill for energy efficient grinding of natural mineral and ores.

Publications

1. **Rahul K. Soni**, S. Jaiswal, S. Dash, C. Eswaraiah, CFD and DEM numerical modelling of industrial vibrating desliming screen for performance optimization and minimal misplacement, Powder Technology, 426, 118630, Aug 2023, doi 10.1016/j.powtec.2023.118630. **IF: 5.64.**

2. **Rahul K. Soni**, S. Dash, C. Eswaraiah. Non-linear steady-state data reconciliation: Theoretical perspective and practical scenarios, The Canadian Journal of Chemical Engineering, 101(6), 3094-3107, June 2023, doi 10.1002/cjce.24794. **IF: 2.5.**
3. T. Santosh, C. Eswaraiah, S.I. Angadi, S.K. Tripathy, **Rahul K. Soni**, D.S. Rao, An Energy Efficient Advanced Comminution Process to Treat Low-Grade Ferrochrome Slag Using High-Pressure Grinding Rolls, Energies, 16(7), 3139-3153, March 2023, doi 10.3390/en16073139. **IF: 3.252.**
4. **Rahul K. Soni**, C. Eswaraiah, S. Tripathy, M. Bose, P.S. Goswami. Review on the chemical reduction modelling of hematite iron ore to magnetite in fluidized bed reactor, Reviews in Chemical Engineering, 1-44, Dec 2022, doi 10.1515/revce-2022-0021. **IF: 8.74.**
5. T. Santosh, C. Eswaraiah, **Rahul K. Soni**, S. Kumar. Size reduction performance evaluation of HPGR/ball mill and HPGR/stirred mill for PGE bearing chromite ore, Advanced Powder Technology, 34(1), 103907-103918, Jan 2023, doi 10.1016/j.apt.2022.103907. **IF: 4.84.**
6. T. Santosh, **Rahul K. Soni**, C. Eswaraiah, S. Kumar, D.S. Rao, R. Venugopal. Modelling and application of stirred mill in coarse grinding for PGE bearing chromite ores, Separation Science & Technology, 58(1), 149-163, Jan 2023, 10.1080/01496395.2022.2075754. **IF: 2.799.**
7. T. Santosh, **Rahul K. Soni**, C. Eswaraiah, S. Kumar. Application of artificial neural network method to predict the breakage properties of PGE bearing chromite ore, Advanced Powder Technology, 33(3), 103450, March 2022, doi 10.1016/j.apt.2022.103450. **IF: 4.84.**
8. **Rahul K. Soni**, R.K. Dwari. DEM numerical studies on the design and efficiency of the continuous operating triboelectric separator, Advanced Powder Technology, 31(4), 1624-1632, April 2020, doi 10.1016/j.apt.2020.02.005. **IF: 4.84.**
9. T. Santosh, **Rahul K. Soni**, C. Eswaraiah, D.S. Rao, R. Venugopal, Optimization of stirred mill parameters for fine grinding of PGE earing chromite ore, Particulate Science & Technology, 39(6), 663-675, July 2020, doi 10.1080/02726351.2020.1795016. **IF: 2.628.**
10. C. Eswaraiah, **Rahul K. Soni**, S.K. Tripathy, L.O. Filippov, Particle classification optimization of a circulating air classifier, Mineral Processing and Extractive Metallurgy Review, 40(5), 314-322, Aug 2019, doi 10.1080/08827508.2019.1643340. **IF: 4.287.**
11. **Rahul K. Soni**, R. Mohanty, S. Mohanty, B.K. Mishra, Numerical analysis of particles mixing in drum mixers using DEM, Advanced Powder Technology 27(2), 531-540, March 2016, doi 10.1016/j.apt.2016.01.016. **IF: 4.84.**
12. **Rahul K. Soni**, C. Eswaraiah, B.K. Mishra, A novel and direct approach for modeling and simulation of impact grinding, Advanced Powder Technology 26(3), 1031-1039, May 2015, doi 10.1016/j.apt.2015.04.009. **IF: 4.84.**
13. C. Eswaraiah, **Rahul K. Soni**, Milling and classification of printed circuit boards for material recycling, Particulate Science & Technology 33(6), 659-665, April 2015, doi 10.1080/02726351.2015.1020179. **IF: 2.628.**
14. R. K. Dwari, S.K. Mohanta, B. Rout, **Rahul K. Soni**, Studies on the effect of electrode plate position and feed temperature on the tribo-electrostatic separation of high ash Indian coking coal, Advanced Powder Technology, 26 (1) 31-41, Jan 2015, doi 10.1016/j.apt.2014.08.001. **IF: 4.84.**

International Conferences and seminars

1. S. Rout, **Rahul K. Soni**, S.D. Barma, C. Eswaraiah, Beneficiation aspects to improve the quality of Bauxite waste PLK rock, 74th Annual Session of Indian Institute of Chemical Engineers-CHEMCON, 27-30 December, 2021, CSIR-IMMT, Bhubaneswar, India.
2. **S. Dash, Rahul K. Soni, S. Mohanty**, Data reconciliation for vanadium balance in an Alumina refinery, Proceedings of European Metallurgical Conference (EMC) (ISBN: 978-3-940276-87-2), 1, 5-16, Düsseldor, Germany, 23-26 June 2019, doi 10.6084/m9.figshare.19368848
3. **Rahul K. Soni, B.K. Mishra**, Understanding size segregation in tumbling mills, Proceedings of the 7th

International Conference on Discrete Element Methods (DEM'7) (ISBN: 978-9811019258), Dalian, China, Dec 2016, 1153-1168, doi 10.1007/978-981-10-1926-5_120

4. S. Dash, **Rahul K. Soni**, S. Mohanty, B. K. Mishra, Preliminary CFD studies of a continuous industrial scale fluidized bed roaster, Eleventh International Conference on CFD in the Minerals and Process Industries (ISBN: 9781486306206), CSIRO, Melbourne, Australia, 7-9 Dec, 2015, 1-6, doi 10.6084/m9.figshare.19368806
5. C. Eswaraiah, **Rahul K. Soni**, S.K. Behera, B.K. Mishra, Analysis of model parameters dependency on breakage characteristics of single particle comminution, International Mineral Processing Congress (IMPC) (ISBN: 81-901714-3-7), New Delhi, Sep 2012, doi 10.6084/m9.figshare.19368719
6. **Rahul K. Soni**, A. Mishra, J. Mangla, Development of a low cost peanut decorticator machine for use in developing countries, Synergy and Technical Development International Conferences, Gödöllö, Hungary, Aug 2009, doi 10.6084/m9.figshare.19368950

Book chapters

1. S. Rout, S.D. Barma, **Rahul K. Soni**, P.K. Baskey, C. Eswaraiah, D.S. Rao, Beneficiation aspects to improve the quality of bauxite mining waste PLK rock, Sustainable Chemical, Mineral and Material Processing, pp. 189-201, 2023, ISBN 978-981-19-7263-8, DOI 10.1007/978-981-19-7264-5

Conferences presentations

1. **Rahul K. Soni**, C. Eswaraiah, M. Bose, P.S. Goswami, CFD-DEM Modelling of Reduction of Hematite Iron Ore (Fe_2O_3) to Magnetite (Fe_3O_4) by Blast Furnace Flue Gas, Net-Zero Emission Technologies for Sustainable Development: Challenges and Opportunities, (NoET - 2022), 12-12 December, IIT (ISM) Dhanbad, India.
2. S. Rout, **Rahul K. Soni**, C. Eswaraiah, Comminution studies of Carbonite rock: Evaluation of energy and breakage kinetics, 74th Annual Session of Indian Institute of Chemical Engineers-CHEMCON, 27-30 December, 2021, CSIR-IMMT, Bhubaneswar, India.
1. **Rahul K. Soni**, S. Dash, S.P. Tiwari, Data Reconciliation by Successive Linearization: The shortfalls, XVII International Seminar on Mineral Processing Technology, 10-12 December, 2018, IIT Dhanbad, India.
2. T. Santosh, **Rahul K. Soni**, S. Angadi, C. Eswaraiah, R. Venugopal, Energy efficient high pressure grinding rolls to treat low grade PGE ores, XVII International Seminar on Mineral Processing Technology, 10-12 December, 2018, IIT Dhanbad, India.
3. S. Rout, **Rahul K. Soni**, T. Santosh, C. Eswaraiah, Studies on communition characteristics of carbonatite rocks to determine the energy and kinetic parameters of ball mill, XVII International Seminar on Mineral Processing Technology, 10-12 December, 2018, IIT Dhanbad, India.
4. T. Santosh, **Rahul K. Soni**, S.K. Angadi, S.K. Tripathi, C. Eswaraiah, R. Venugopal, Stirred milling of ferrochrome slag for selective comminution, National Conference on Waste to Wealth in Mineral and Metullargical Industries (WWMMI), 9-10 March, CSIR-IMMT, Bhubaneswar, 2018.
5. T. Santosh, **Rahul K. Soni**, S.K. Angadi, S.K. Tripathi, C. Eswaraiah, Studies on Comminution Characteristics of Ferrochrome Slag in High Pressure Grinding Rolls, National Conference on Waste to Wealth in Mineral and Metullargical Industries (WWMMI), 9-10 March, CSIR-IMMT, Bhubaneswar, 2018.
7. B.K. Mishra, S. Mohanty, B. Das, **Rahul K. Soni**, Sustainability of Iron ore mining in India, International seminar on Mineral Processing Technology (MPT), Pune, 2016.

8. **Rahul K. Soni**, C. Eswaraiah, B.K. Mishra, Determination of single particle comminution characteristics by drop weight test, International seminar on Mineral Processing Technology (MPT), Jamshedpur, 2010.

Funded research projects completed

1. Leading the project titled "Continuous extraction of magnetite reduced from the low-grade iron ores in the fluidized bed reactors for the higher productivity", role: Principal investigator, duration: 2022-2025, funding agency: SERB, DST India.
2. Lead the project titled "Development of process flowsheet for the recovery of Individual heavy minerals from the mineral sand plant tailings", role: Principal investigator, duration: 2022, funding agency: Hindustan Zinc Ltd. (HZL) and Ministry of Mines, Govt. of India.
3. Worked on project titled "Characterization and Beneficiation of Low-grade Bauxite Ores from Gujrat", role: Mathematica modelling and optimization of process, duration: December 2021 to July 2022, funding agency: Geological Survey of India (GSI), India.
4. Lead the project titled "Modelling and optimization of desliming screen performance at coal washeries for higher productivity at minimal displacement", role: Principal investigator, duration: 2018-2020, funding agency: TATA Steel R&D, Jamshedpur.
5. Lead the project titled "In-house development and fabrication of stirred mills for energy-efficient processing of low grade ores", role: Principal investigator", duration: 2018-2020, funding agency: CSIR, Govt. of India.
6. Co-Lead the project titled "Feasibility study on combustion of Petcoke-coal fuel mix in a Fluidized bed reactor (FBR) and reduction of emission through appropriate dosages of chemical reagents during combustions", role: Co-Principal investigator", duration: 2020-2022, funding agency: CSIR, Govt. of India.
7. Lead the software development in project titled "Data Reconciliation for Vanadium and Zinc Balance at the Alumina Refinery", role: Lead the mathematical modelling and software development work, duration: 2017-2018, funding agency: National Aluminium company (NALCO).
8. Worked on project titled "Modeling and optimization of high concentration iron ore fines/concentrate slurry pipelines for Indian iron ore processing industries", role: Mathematical modelling of concentrated slurry flow, duration: 2017-2020, funding agency, Govt. of India.
9. Worked on the project titled "Energy efficient advanced comminution process to treat low grade Indian ores for energy conservation", role: Performed grinding studies of material, duration: 2017-2019, funding agency, Govt. of India.

Professional Memberships

1. Institute of Engineers of India (IEI), Life time member, Membership No. M-1714060
2. Indian Institute of Chemical Engineers (IIChE), Life time member, Membership No. LM-70252
3. Indian Institute of Mineral Engineers (IIME), Life time member, Membership No. LM-1228

Fellowships

1. Kishore Vaigyanik Protsahan Yojana (KVPY) [In English: Junior Scientist Promotion Scheme] fellowship awarded by Ministry of Science & Technology and administered by Indian Institute of Science (IISc), Bangalore.
2. IIT (ISM)-merit cum means scholarship & f r e e -ship for session 2009-10 and 2008-09, respectively.

Theses

1. Master of Technology: Study of discrete element method (DEM): methodologies and applications in mineral engineering. Guide: Prof. R. Venugopal, Dean (R&D), Indian Institute of Technology (IIT), Dhanbad, doi 10.13140/RG.2.2.36417.76642
2. Bachelor of Technology: Bed particle breakage studies and energy distribution analysis for mixture of minerals. Guide: Prof. V.K. Gupta, Indian Institute of Technology (IIT), Dhanbad, doi 10.13140/RG.2.2.10621.03049

Research Internships

1. May-July, 2011: Ball mill Simulation with DEM source code Millsoft©1997 [University of Utah] Guide: Prof. B. K. Mishra, Director, CSIR-Institute of Minerals & Materials Technology, doi 10.13140/RG.2.2.33072.15366
2. May-July, 2010: Single particle breakage studies with computer monitored twin pendulum device Guide: Dr. C. Eswaraiah, Scientist, CSIR-Institute of Minerals & Materials Technology, doi 10.13140/RG.2.2.34749.87527
3. May-June, 2009: Numerical solution to ordinary differential equations using Scilab and MATLAB Guide: Prof. K.M. Moudgalya, Department of Chemical Engineering, Indian Institute of Technology, Bombay, doi 10.13140/RG.2.2.26351.43688

Patents

1. Patent filed on Agitators of stirred mills for fine and ultrafine grinding applications, R. Soni, S. Rout, S. Das, C. Eswaraiah, IP India, App. No. 202111053719.
2. Granted Indian patent number 399254: A Self-Automated Mechanical Solar Tracker Device, A. Soni, R. Soni, IP India office, Patent No. 299254 since 06/12/2013.
3. Patent in process: Development of A Low Cost Peanut Decorticator for use in Developing Countries, A. Mishra, R. Soni, J. Mangla. IP India office, App. No. 1422/Kol/2009, publication (U/S 11A) on 23/04/2010.
4. Granted Indian patent number 283831: Development of An Improved Bottles/Cans Filling Machine, R. Soni, K. D. Pany. IP India office, Patent No. 283831 since 06/05/2009.

Awards

1. S. Rout , R.K. Soni, C. Eswaraiah for the paper entitled "Comminution of Carbonatite Rock: Optimization of Energy and Kinetic Parameters" presented during the 62nd Annual Technical Session of Odisha State Centre, The Institution of Engineers (India) on 28th March 2021.
2. Champion award to S. Rout, Rahul K. Soni, C. Eswaraiah in "e-Behind The Teacher's Desk-2020 (e-BTTD-2020)" organized by Indian Institute of Metals in association with TATA Steel and NML Jamshedpur on 28th August 2020.
3. National Budding innovators award'2010 for designing self-automated mechanical solar tracking device by National Research Development Corporation, India.
4. Third prize with token money of 500 USD for demonstrating self-designed peanut decorticator in Techfest'2010 event at Indian Institute of Technology (IIT), Bombay.
5. Second prize with token money of 100 USD for overnight design of ore elevator in Great Step'2008 event at Indian Institute of Technology (IIT), Kharagpur.
6. Consolation prize for a case study competition on cost optimization in mine planning in Great

Step'2008 event at Indian Institute of Technology (IIT), Kharagpur.

7. Consolation prize for demonstrating self-designed bottle filling machine in Techkriti'2008 event at Indian Institute of Technology (IIT), Kanpur.
8. Second prize for designing a bot in Mechathalon'2007 event at Indian Institute of Technology (IIT), Dhanbad.

Leadership Skills

1. Organized 9 days 'Symposium on engineering applications of MATLAB' with the capacity of event manager at Indian Institute of Technology (IIT), Dhanbad.
2. Worked as one of the three key members who have taken start-up for robotics club and rural initiative lab in Indian Institute of Technology (IIT), Dhanbad.
3. General Secretary, Indian Institute of Mineral Engineers (IIME)-Student Chapter, Dhanbad.
4. National Cadet Corps (NCC) 'A' Certificate holder.

Proficiencies (Software)

DEM (LIGGGHTS, EDEM), CFD (Ansys, OpenFoam, Gmsh, Pointwise), Image processing (MATLAB, ImageJ), Computational (MATLAB, Scilab), Data Acquisition (LabView), CAD (CATIA, Solidworks, FreeCAD), Language (python, C, C++).