

1. Name: Sahendra Ram

2. Date of Birth: 18.10.1974



3. Current Position and Address: Sr. Technical Officer
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4. Educational qualifications: (Graduation and above)

Sl. No.	Degree/ Certificate	Year of Passing	University/ Institute	Subjects
i	B. Tech. (Mining Engg.)	2010	V. B. University, Hazaribagh/ BIT, Sindri	Mining
ii	Ph. D. Perusing	---	ISM, Dhanbad	Mining

5. Work experience

Designation	Institution/company	From	To	Nature of work
i Technical Assistant	CSIR-CIMFR	April, 1999	March, 2004	R&D for efficient u/g coal mining
ii Sr. Technical Assistant	CSIR-CIMFR	April, 2004	March, 2009	-do-
iii Technical Officer	CSIR-CIMFR	April, 2009	March, 2012	-do-
iv Sr. Technical Officer	CSIR-CIMFR	April, 2012	Till Date	-do-

6. Area of specialization:

Rock Mechanics, Numerical Modeling, Mechanised/Semi-mechanised Bord & Pillar Workings, Mining Methods for Extraction of Thick Coal Seam, Ground Control Investigation during Depillaring using Geo-technical Instruments.

7. Honors/Awards received:

Silver Medal of the Mining Geological & Metallurgical Institute of India in 2005-2006.

8. Fellowships/Scholarships: ---

9. No. of Research Publications:

- Papers in journals : Eleven (Four in foreign journals)
- In conference proceedings : Fifteen (Six in international conferences)
- Invited/key-note addresses: ---
- List of best 05 publications:
 - (i) **Sahendra Ram**, Dheeraj Kumar, P. Konicek, Amit Kr Singh, Rakesh Kumar, Arun Kr Singh, and Rajendra Singh (2015). Rock mechanics studies during continuous miner based coal pillar extraction in Indian coalfields. Transactions of MGMI, ISSN 0254-8003, vol. 111: April 2014-March 2015, pp 89-104.
 - (ii) **Sahendra Ram**, Dheeraj Kumar, Rajendra Singh, Ashok Kumar and Arun Kumar Singh (2015). Influence of overlying roof strata on rib design in mechanised depillaring. *Communicated to The Arabian Journal for Science and Engineering*.
 - (iii) Rajendra Singh, P. K Mandal, A. K. Singh, R. Kumar, **Sahendra Ram** and S. K. Jena, (2005). Encountering induced horizontal stress during simultaneous depillaring of thick and contiguous sections below hilly terrain: A case study. *MGMI Transaction, Vol. 102, No. 1 & 2, April 2005 – March 2006, pp. 37-61*.
 - (iv) R. Singh, **Sahendra Ram**, Amit Kumar Singh, Shailly Prasad and John Buragohain (2004). Underground extraction of contiguous coal seams/sections consisting thin parting: a case study. *Journal of South African Institute of Mining and Metallurgy (SAIMM)*, 104(1): 17-27.
 - (v) P. K. Mandal, Arun Kumar Singh, **Sahendra Ram**, Amit Kumar Singh, Nirmal Kumar and R. Singh (2004). Strata behaviour investigation of India's first depillaring face with continuous miner and shuttle car. *Minetech*, 25(6): pp.3-12.

10. Number of Books authored/edited: ---

11. (a) No. of Patents granted/applied for: One

- (i) "A model for rib/snook design in mechanised depillaring under moderate roof strata" by R. Singh, A. K. Singh, **S. Ram**, A. Kumar, R. Kumar and A. K. Singh: November 2015.

(b) Technologies developed, Licensed and/or commercialized:

I devoted my research activities in studying response of rock-mass for a redistributed state of stress and strain situation of the underground coal mining with widely varying geomining conditions during different conventional and mechanised depillaring operations. In addition to my active contribution in development of the award winning mining methods like - cable bolting based depillaring of thick seams, wide stall mining, "Underpinning based simultaneous extraction of contiguous sections under fragile parting" and "Cross development based underground extraction of a critically thick coal seam standing on pillars and the

development made along the roof horizon”; my recently developed of models for the design of rib and breaker-line support for CM based mechanised depillaring proved to be crucial for the efficiency of the mass production technology.

I was also extensively engaged in field study to generate data and analysis in laboratory for development and application of a new process: known as “Combined instruments Approach” (CIA) for the strata mechanics proved to be an efficient method to improve safety of underground workings.

After laboratory validations (on simulated models) of different conceptual ideas, successful efforts are made to translate some of these ideas into large scale practice by the industry for optimal design of underground mining structures. Coal mining industry of the country has widely accepted and acknowledged the techno-economical superiority of these R&D developments. These R&D efforts have earned considerable appreciations, large number of citations and prestigious awards too.

12. Foreign visits:

Czech Republic	21-Oct-2012	07-Nov-2012	Institute Geonics, Ostrava	Interacted with scientists of Czech under CSIR-CSAV exchange programme
Czech Republic	21-June-2014	01-July-2014	Institute Geonics, Ostrava	Attended and presented a paper in the 5 th International Colloquium on Geomechanics and Geophysics

13. Details of Professional memberships: ---

14 . Major contributions: (Max. 150 words)

My extensive field study and numerical modelling provided valuable addition to R&D in mining industry. It reflects successful completion of different industry-sponsored and S&T projects of the Ministry of Coal, Govt. of India. Considerable number of technical papers published in the reputed rock-mechanics/mining engineering journals and seminars. In last sixteen years of my service, I devoted in investigation of more than 80 projects related to applied and basic research. The investigation provided excellence of production, productivity and safety during mechanised and semi-mechanised depillaring. I also participated in a collaborative R&D work (at higher depth of cover) with Institute of Geonics, the Czech Republic. Some of the important R&D contributions are:

- (i) Design of different elements for Continuous Miner based mechanised depillaring.
- (ii) Numerical Modeling and field investigation based performance evaluation.
- (iii) Extensive ground control study using different geo-technical instruments and automation of measurements of strata movement during underground coal mining.
- (iv) Development of underground coal mining methods (including one patented).
- (v) Study of effect of geological discontinuities over strength of rock/coal mass through Non Destructive Approach.
- (vi) Empirical models for mining induced stress development during depillaring.

15. Technologies and Products/ Services

(i) Developed:

- Rib/snook design in CM based mechanised depillaring under moderate roof strata.
- Manner of extraction and norms to design underground mining structures for a fully mechanized depillaring of locked-up coal pillars in the deep seated deposits.
- Mining method for final extraction of a critically thick coal seam standing on pillars and developed along the roof horizon.
- Underpinning based depillaring method for thick and contiguous seams/sections under weak and laminated partings.
- Formulation of an empirical relationship for estimation of amount and range of mining induced stress over the natural supports (pillars/stooks/ribs) around a depillaring face.
- Cable bolting based method of mining for extraction of thick and difficult coal seams
- Eco-friendly mining method for partial extraction of coal from locked-up pillars under various surface and sub-surface constraints.
- Combined-Instrument-Approach (CIA) for strata movement study.

(ii) Licensed:

All these developments are, mainly, based on fundamental rock mechanics principles and large scale investigations in field and laboratory. However, these developments are to be adopted under the existing geo-mining conditions of a coal seam. Further, it is very difficult to have any “typical” geo-mining condition, which can be used as a benchmark to standardize different parameters associated with these developments. Therefore, all these developed technologies are directly provided to the mining industry by CSIR-CIMFR only *after a suitable endorsement/tuning in the design parameters* (as per the selected site conditions). The requirement of good knowledge/understanding of rock-mass (natural material) properties, geology and stress conditions for each implementation site are important inputs for the endorsement/tuning. Accordingly, CSIR-CIMFR did not give license directly to any industry/organization but makes it adoptable for the given site conditions.

(iii) Commercialized:

All the above mentioned methods/processes are extensively used and being used by the coal mining industry. Technical services related to implementation of these developments under the given site conditions have been rendered (in terms of sponsored/ consultancy projects) to more than 100 coal mines and most of them have achieved good success.

16. Designs and Prototype Developed:

Consistent involvement in different important geo-technical investigations helped me in developing good understanding of geology and rock mass of Indian coalfields. This helped me not only in development of above mentioned indigenous technologies but enriched my knowledge and understanding about the complete spectrum of uniqueness of Indian geo-mining conditions. This knowledge base and understanding enabled me to develop following designs and prototypes, in addition to the above mentioned methods/technologies:

- Optimisation of design of roof bolt based breaker-line for a mechanised depillaring,
- Extraction of full thickness (6m) of coal seam in single lift by CM technology,
- Successful retrieval of buried CM using fore-polling support under fallen material,
- Computer vision based (on-line) system for strata movement monitoring in hazardous areas of mines,
- Adoption of suitable caving models under varying depth of cover and the nature of roof strata for efficient depillaring and
- Design of underground instrumentation pattern and monitoring frequency.

17. Honours and awards won for technological contributions or sociological impact of R&D:

- (i) Silver Medal of the Mining Geological & Metallurgical Institute of India in 2005-2006.



Signature