

1. **Name** : Dr. Sanjay Kumar Roy
2. **Date of birth** : 20.01.1974
3. **Current position & address** : Sr. Principal Scientist  
Rock Slope & Equipment Safety  
CSIR-CIMFR, Barwa Road, Dhanbad  
Email : sanjaykroy.cmri@gmail.com  
Mobile : 9471192140, 9835579647
4. **Educational Qualification (Graduation & Above)** :

| Sl. No. | Degree            | Subject                           | Class Marks  | Year | College / University                    | Additional Particulars  |
|---------|-------------------|-----------------------------------|--|------|---|---|
| a.      | B.Sc. Engineering | Mining Engineering                | 83.06 %  | 1996 | BIT, Sindri / V.B.University, Hazaribag | <ul style="list-style-type: none"> <li>• Rural scholarship from 1985-88</li> <li>• Recipient of Deshpande-Atkinson Scholarship for 1993 &amp; 1994</li> <li>• Recipient of BalTrivedi Scholarship for 1995.</li> <li>• First topper of college in second year of B. Sc. Engineering.</li> </ul> |
| b.      | M. Tech.          | Reliability & Quality Engineering | 9.36 out of 10   | 1999 | IIT, Kharagpur                          | <ul style="list-style-type: none"> <li>• Second topper of college in first year of B. Sc. Engineering</li> <li>• Throughout branch topper in B. Sc. Engineering</li> <li>• Distinction in each subject every year in B.Sc. Engineering &amp; M. Tech</li> </ul>                                 |
| c.      | Ph.D.             | Title<br>Name of the guide        | : Studies into the sensitivity, safety and performance characteristics of permitted explosives<br>: Dr. U. K. Dey, Professor & Head,<br>: Mining Engineering Department, BIT Sindri,<br>: VinobaBhaveUniversity, Hazaribag |      |   |   |

5. **Work experience** : 18 years 9 months at Explosive & Explosion Laboratory of CSIR-CIMFR. Joined Rock Slope Section of CSIR-CIMFR from 06.06.2016
6. **Area of specialisation** : Safety & Performance of commercial explosives  
Rock Slope Engineering

**7. Honours / Awards Received :**

- (a) **National Geosciences Award in Mining Engineering -2012** given by **Ministry of Mines, Government of India** on **25.02.2014**
- (b) **CSIR Technology Award for Physical Sciences including Engineering – 2012** given by **Council of Scientific and Industrial Research (CSIR)** on **26.09.2012**
- (c) **Mining Engineering Design Award - 2014** given by **The Institution of Engineers** on **19.12.2014**
- (d) **CSIR – Golden Jubilee CMRI – Whitekar Annual Award, 2003** (below 35 years age) given by **CMRI, Dhanbad** on **25.02.2014**
- (e) **One year early promotion** (Scientist-C to Scientist-E<sub>1</sub> in 3 years) by **Recruitment and Assessment Board (RAB) of CSIR**
- (f) Appreciation letter from **Director General**, Council of Scientific & Industrial Research (CSIR) for developing non-NG explosive-cord system.
- (g) Appreciation letter from **Chairman & Managing Director**, Singareni Collieries Company Limited (SCCL) for developing non-NG explosive-cord system.
- (h) Appreciation letter from **Chief Controller of Explosives**, Petroleum & Explosives Safety Organisation (PESO) for developing non-NG explosive-cord system.
- (i) Appreciation from **Research Council**, for developing non-NG explosive-cord system
- (j) Appreciation letter from **Bharat Pharma**, New Delhi for UN classification system
- (k) Citation from CSIR-CIMFR for filing of patent application in 2006 -07
- (l) Citation from CSIR-CIMFR for filing of patent application in 2005 -06
- (m) Citation from CSIR-CIMFR for raising third highest external cash flow (ECF) in 2005- 06
- (n) Citation from CSIR-CIMFR for raising ECF of CIMFR through GAP project in 2005- 06

**8. Fellowship / Scholarship :**

- Rural scholarship from 1985-88
- Recipient of Deshpande-Atkinson Scholarship for 1993 & 1994
- Recipient of BalTrivedi Scholarship for 1995

**9. No. of research Publications :**

- Paper in journals : 28
  - In conference proceedings : 21
  - Invited / key-note address : 7
  - List of best 5 publications :
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- **S.K. Roy** and R.R. Singh, 2011, Use of spacer aided initiation technique in solid blasting in Indian underground coal mines, *Transactions of the Institutions of Mining & Metallurgy, Section A : Mining Technology*, Vol. 120, No. 1, pp 25-35.
  - **S.K. Roy**, R.R. Singh, V.V. R. Rao and Om Prakash, 2009, Development of non-nitroglycerine based explosive – cord system for blasting gallery method in India, *Transactions of the*

*Institutions of Mining & Metallurgy, Section A : Mining Technology*, Vol. 118, No. 2, pp 59-66.

- **S.K. Roy**, R.R. Singh, R. Kumar and U.K. Dey, 2008, *Studies into the possible use of air decking in solid blasting in Indian underground coal mines*, Transactions of the Institutions of Mining & Metallurgy, Section A : Mining Technology, Vol. 117, No. 2, **2008**, pp 83-92.
- **S.K. Roy**, R.R. Singh, R. Kumar and U.K. Dey, 2008, *Effect of using plastic spacers on toxic fume generation by permitted explosives*, The Journal of South African Institute of Mining and Metallurgy, Vol. 108, No. 11, November **2008**, pp 691-699.
- **S.K. Roy**, R.R. Singh, R. Kumar and U.K. Dey, 2007, *Evaluation of velocity of detonation of permitted explosives*, Blasting and Fragmentation, Vol. 1, No. 1, September 2007, pp 69-79

10. **No. of books authored / Published** : NIL

11. **(a) No. and details of patents granted /applied for** :  
**(b) Technology developed, licenced and / or commercialised** :

**A. Title of the patent :** **New emulsion explosive and cord system suitable for use in blasting gallery method in underground coal mines**  
Inventors : **S.K. Roy**, R.R. Singh, R. Kumar, V.V.R. Rao & S.K. Nayak  
CSIR Ref. No. : 0156NF2006  
Patent Application No. : 2468DEL2006 dated 16.11.2006  
Patent Application No. : **2468DEL2006 dated 16.11. 2006 (provisional) & dated 10.05.07 (complete)**  
Technology Transferred to: **M/s Indian Explosives Limited, Gomia**  
Royalty earned : **Rs. 36.23 lakhs**

**B. Title of the patent :** **A method for solid blasting in underground coal mines**  
Inventors : **S.K. Roy**, R.R. Singh, H.K. Verma & R.K. Paul  
CSIR Ref. No. : 0454NF2004  
Patent Application No. : 1538DEL2005 dated 10.06.2005  
Technology Transferred to: **M/s Gulf Oil Corporation Limited, Hyderabad**  
Status : **Approved by DGMS and is under trial in different mines**

12. **Foreign Visit** : Deputed to china to attend Seventh International Symposium on Fragmentation by Blasting (Fragblast 7), held at Beijing, China during 11-15 August 2002

13. **Details of professional memberships** :  
Member of Section Sub-Committee CHD 26 of Bureau of Indian Standard, New Delhi  
Expert member in Mining Engineering for BIT, Sindri

## 14. Major Contributions :

### **(I) Development of explosive-cord system for a new life to Blasting Gallery method in India**

This **CSIR Technology Award - 2012 wining work** resolved a national issue and technological challenge. Development of patented first and so far only approved type of non-nitroglycerine based explosive - cord system gave a new life to highly productive Blasting Gallery (BG) method of mining thick coal seams from underground mines in India.

Blasting Gallery (BG) method suffered a major setback due to ban of nitro-glycerine (NG) based explosives in 2004 by Ministry of Home Affairs on safety and security issues. Development of non-NG based explosive - cord system for continuation of production from BG method was a **national issue which were evident from the letters from DG, CSIR, Ministry of Home Affairs, Ministry of Coal & Mines, Ministry of Commerce & Industry and user industries.**

I applied following ideas for the *first time in designing permitted explosives*

- *using flame retardant polymer (FRP) tube as an additional safety cover*
- *decreasing the diameter from 32mm to 25mm*
- *providing channel in the FRP tube for better contact between explosive and cord*
- *increasing severity of test conditions for enhancement of safe maximum charge within the restrictions of existing setup*

which finally led to the successful development of an emulsion explosive (**Powering**) and cord (**Powercord**) system within the stipulated time of March, 2006. **This development helped in resumption and continuation of production of about 1.5 million tonnes coal from BG method and thus avoiding the major national loss and industrial unrest.**

Significant outcomes of this work are

- Prestigious **CSIR Technology Award – 2012** for Physical Sciences including engineering awarded on 26.09.2012 (**Annexure-II**)
- **Royalty of Rs. 36.23 lakhs** to CIMFR
- Implementation of **complete ban on nitro-glycerine (NG) explosive** by Govt. of India.
- Newly developed explosive-cord system has been **applied for patent** through CSIR
- Safety, post detonation fumes and performance of new system is better than previous NG-based explosive cord system.
- Appreciation letters from DG, CSIR; CMD, SCCL; CCOE, PESO etc. (**Annexures-VII & X**)

### **(II) Patented blasting technique for improved pull and yield in solid blasting of U/g coal mines**

Under Ministry of Coal & Mines funded S&T project developed a method of **spacer-aided-initiation (SAI) technique for achieving longer pull in solid blasting**. The method has been applied for **patent** through CSIR and technology has been transferred to M/s Gulf Oil Corporation Limited, Hyderabad. This method envisages use of air gap between cartridges for the first time in underground coal mines. A **unique slurry P<sub>5</sub> explosive** with very high **air gap sensitivity (15cm)** has also been developed under the project for use with this new method. A pull of 2.1m with modified burn-cut pattern of blasting and around 1.5m with existing wedge cut pattern of solid blasting has been achieved in GDK-5 incline of SCCL. **DGMS have approved the method of blasting with newly developed explosive and trials are being undertaken in different underground coal mines of CIL and SCCL** including degree-III gassy mines to be eligible for participation in CIL tender. Thus, this method has potential to drastically change the economics of around 300 underground coal mines in India.

### **(III) Establishment of national standards and standard methodology**

- Evaluation of deflagration characteristics of permitted explosives
- Blast damage index (BDI) for safety of opening in underground coal mines
- Incendivity characteristics of 32 mm diameter cartridges permitted explosives which helped in improvement of safety of underground mining workings vis-à-vis explosive usage.

### **(IV) R&D assistance to indigenous explosive manufacturers**

- New and cost-effective emulsion permitted explosives to phase out NG / slurry permitted explosives for improved safety during their usage in underground coal mines
- Cost-effective steel shell (e.g. copper coated, epoxy coated, powder coated, passivated etc.), high strength, innovative (e.g. use of AS, KBG, NHN etc. as primary charge) permitted detonators

which helped in improvement of safety, quality, productivity and competitiveness of Indian explosive products leading to increased safety and performance during their usage in Indian underground coal mines.

### **(V) Export promotion of explosives**

The nominee took lead role in establishment of some important facilities for UN classification of explosive products for the first time in India for export promotion of explosive products which has helped in Indian explosive manufacturing industry to cover a long way from total import dependency to be now a major exporter.

### **(VI) Assistance in introduction of first “Underground Trapped Miner Location System”**

Planning and execution of studies into the effect of radio frequency on permitted detonators for the first time in India by the nominee paved the way for approval by Directorate General of Mines Safety for introduction of first “Underground Trapped Miner Location System” developed by M/s Tata Consultancy Services, Kolkata under an S&T project funded by Ministry of Coal in Indian underground coal mines. Introduction of first mobile communication system like “Underground Trapped Miner Location System” will have significant impact on improvement of safety of Indian underground coal mines in long run especially during disasters in mines.

### **(g) Others significant contributions**

- (i) Services related to statutory testing of permitted explosives and detonators for assessing their suitability for use in underground coal mines. Low rate of accidents while using permitted explosives in Indian coal mines corroborates the high level of safety standards and transparent testing practices followed by him at Explosive & Explosion Laboratory of CIMFR.
- (ii) Investigations into the incidences related to use of explosives in mines carried out by him helped DGMS and PESO in deciding the possible reasons and remedies to avoid their recurrences.
- (iii) Services for periodic evaluation of quality of explosives products to different coal companies have helped in improving the standard of quality of explosive products supplied by different manufacturers to them and thus helped in improving their safety and productivity.

15. **Technologies and Product / Services** :  
**(i) Developed, (ii) Licenced (iii) Commercialised** :

**A. Title of the patent :** **New emulsion explosive and cord system suitable for use in blasting gallery method in underground coal mines**  
Inventors : **S.K. Roy, R.R. Singh, R. Kumar, V.V.R. Rao & S.K. Nayak**  
CSIR Ref. No. : **0156NF2006**  
Patent Application No. : **2468DEL2006 dated 16.11.2006**  
Patent Application No. : **2468DEL2006 dated 16.11. 2006 (provisional) & dated 10.05.07 (complete)**  
Technology Transferred to: **M/s Indian Explosives Limited, Gomia**  
Royalty earned : **Rs. 36.23 lakhs**

**B. Title of the patent :** **A method for solid blasting in underground coal mines**  
Inventors : **S.K. Roy, R.R. Singh, H.K. Verma & R.K. Paul**  
CSIR Ref. No. : **0454NF2004**  
Patent Application No. : **1538DEL2005 dated 10.06.2005**  
Technology Transferred to: **M/s Gulf Oil Corporation Limited, Hyderabad**  
Status : **Approved by DGMS and is under trial in different mines**

16. **Designs and Prototype developed** : **NIL**

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

- (a) **National Geosciences Award in Mining Engineering -2012** given by **Ministry of Mines, Government of India** on **25.02.2014**
- (b) **CSIR Technology Award for Physical Sciences including Engineering – 2012** given by **Council of Scientific and Industrial Research (CSIR)** on **26.09.2012**
- (c) **Mining Engineering Design Award - 2014** given by **The Institution of Engineers** on **19.12.2014**
- (d) **CSIR – Golden Jubilee CMRI – Whitekar Annual Award, 2003** (below 35 years age) given by **CMRI, Dhanbad** on **25.02.2014**