

EXPRESSION OF INTEREST FOR RESEARCH PROJECTS

1.0 Central Mine Planning & Design Institute Ltd (CMPDIL), Ranchi invites Expression of Interest (Eoi) for undertaking R&D work under S&T Scheme of Ministry of Coal from established R&D/Scientific institutes, academic institutions, other organizations engaged in manufacture / supply of mining equipment /accessories or related mining and allied services/activities. Expression of Interest is sought for carrying out scientific studies /field trials on the following topics given in Section 2.0

2.0 Topics for Eoi:

1. Effective method to extract coal standing on pillars below infrastructure / developed area without stowing.

Of the large reserves of coal blocked in developed pillars, a substantial portion is sterilized due to the presence of structures and inhabited localities on the surface. At present, these reserves are partially being extracted with very low percentage of recovery by stowing with sand. In the past, some attempts were made to extract these reserves by wide stall method introduced through R&D, but recovery of coal as observed in this method is also not encouraging i.e, up to 40-45%.

A detailed study is required to develop an effective method to liquidate coal standing on pillars in multi seam workings having seam gradients $>15^{\circ}$ below infrastructure / developed area with due consideration to coal conservation and safety.

2. Safe parting between underground and opencast workings for simultaneous mining.

A number of underground mines are being converted in to opencast mines up to a reasonable depth and beyond this coal extraction is by underground mining operations. This necessitates maintaining adequate parting between opencast and underground workings for successfully sequencing the operations in simultaneous mining.

A detailed scientific study is required for evolving certain guidelines for maintaining safe parting between OC and UG workings for simultaneous mining with due consideration to coal conservation and safety.

3. **Design and development of procedure to assess safe barrier width for advancing benches in opencast mines.**

The safety and operation of opencast mines is often influenced by the height and barrier width of benches. The strata variation in overburden, blasting operations, water seepage due to semi/unconfined aquifers, dewatering, heavy machine operations on overburden (OB) etc. causing slope stability problems of opencast benches and in turn safety of men and materials present at the cut face areas.

A detailed geo-mechanical soil study (shear strength, compaction and consolidation) and also seismic study for optimising barrier width of benches in OBs for safe opencast mining is required under this research work.

4. **Development of online remote field analysis and monitoring system for (a) optimal blast design (b) fragmentation measurement and (c) fly rock risk assessment.**

No such online remote field analysis and monitoring system is so far available in India. Assessment and prediction of fragmentation is presently being done on routine basis by fragmentation tools viz. Wipfrag, Fraglyst etc by digital image analysis through photogrammetry. An integrated system for monitoring of blasting conditions directly from field activities for optimal blast design, improved fragmentation and assessment of fly rock risk is an important area for research study.

To develop a suitable integrated system for monitoring of blasting activities directly from opencast mines is required under this new concept.

5. **Introduction of water jet cutting technology in coal mines for seams on fire.**

Huge reserves of good quality coal are blocked in seams on fire in Indian Coalfields.

A study is required to explore possibility of application of water jet cutting technology to work such coal and overburden / parting rocks of Jharia coalfields, economically with due regard to safety.

The technology which could be developed under this research work should include recovery of cut material and arrangement of recycling of water.

6. **CBM reserves estimation for Indian Coalfields.**

India has large coal reserves which may be amenable for harnessing of coal bed methane (CBM). Several blocks have been carved out and allotted for commercial extraction of CBM.

Carving out more blocks in the green field areas for commercial development of CBM is to be taken up on priority basis to augment energy supply in the country. For reliable assessment of CBM resource for carving out CBM blocks in green field areas, proving of coal reserves is a pre-requisite.

Generation of data base on 3D seismic survey for geological modeling and identification of coal seams for assessment of coal reserves and assessment of gas-in-place resource including in situ reservoir characteristic of coal seams need to be developed under this research work.

7. To produce 10% or less ash clean coal from washery slime.

Beneficiation of fine coal (-0.5mm) is a great challenge now a days. Most of the Coking coal washeries operating under CIL are unable to recover good quality fine coal (Ash % $\leq 10\%$) from slime generated during the washing. India is importing a significant amount of low ash coal from Australia, Canada etc. for steel making which has become an additional burden to the India's foreign exchange deposit.

In order to save foreign exchange and for judicious recovery and use of valuable fine coking coal, a feasibility study followed by installation of a pilot scale plant is the requirement under this research work.

8. On-line washability analysis by using CT system

Presently washability test is carried out manually at Laboratories, which takes normally 6-8 days to complete the testing of a single sample depending upon the number of size fraction and specific grade range.

In order to facilitate quick screen analysis and washability test and also to enhance the capability of the laboratory, a research proposal is invited to develop CT based universal analyser which is not yet practiced in coal preparation.

9. To study the caving behaviour of roof rock due to presence of OB dump on the surface /quarry floor and suggest suitable support design as well as minimum hard cover for safe caving of roof rock.

Due to in-pit dumping in many mines, there is presence of OB dump on the seam quarry floor. It is apprehended that when depillaring will be commenced in lower seams the caving behaviour of roof rock may be affected due to presence of OB dump on the surface.

A study is required for deciding the appropriate method of depillaring and suitable support design under such situations.

10. Fugitive Emissions of methane gas from opencast mines.

In India over 88% of the coal production is coming from open pit mines. It is therefore prudent to have a reliable study of quantum of methane emission as a result of open pit mining both during mining activity and from the exposed faces. While such data is generally available for methane emissions on account of underground mining operations, correct assessment of the same from open pit mining is a challenge.

A pilot study to estimate fugitive emissions of methane at one of the opencast mines in India and to explore possibility of harnessing and utilisation of captured methane gas is considered essential.

11. Early warning system for roof fall prediction in underground mines.

A number of fatalities have occurred in the recent past due to roof failure during bord & pillar operations in underground coal mines. Although some efforts have been made in the past to develop pre-warning systems / devices to forecast impending roof fall in advance, but a reliable device is not yet available for introducing in Indian underground coal mines.

A suitable device for predicting early indication of roof falls is required to be developed. The device needs to be such that it can be operated on regular basis in underground workings, especially during depillaring operations.

12. Early warning system for predicting dump or highwall failures in opencast mines.

A number of fatalities have occurred in the recent past due to sudden collapse of benches /or highwalls in opencast mines. Although considerable efforts have been made in the past to understand the mechanism of these failures, no pre-warning systems / devices have as yet been developed for prior indications for such failures.

Currently in India, opencast mines are being planned to significant depths often being beyond industry's current experience. Therefore, a research proposal is invited for developing a pre-warning system/device for forecasting impending failures in benches/or highwall of opencast mines.

13. High concentration fly ash slurry stowing in underground coal mines.

Due to over exploitation of sand in the rivers around mining areas for construction industry and also non-replenishment of sand in the rivers (near by coal fields) due to construction of dams at the upstream, sand is gradually becoming a scarce material for stowing purpose in underground mining during depillaring operations.

In view of the above, high concentration fly ash slurry backfilling may be considered as a replacement to sand stowing for effective packing of mine voids in underground coal mines.

To establish high concentration fly ash slurry stowing technology as a success, it is required to carry out scientific study through numerical modelling followed by a pilot scale plant for demonstration of its efficacy in one of the underground mines. The technology also should ensure safety of the persons employed during the experimentation.

14. Shale gas estimation in coalfields

Shale gas, contained within the shale is a natural gas which is originated from the organic constituents present in shale. With advancement of harnessing technology of shale gas, it has been proved to be an important energy resource in other countries.

The existence of huge sedimentary basin and reported occurrence of thick pile of shale in the Gondwana basin, enhances the chance of getting commercially viable shale gas deposit in India.

A study is required to assess potentiality of shale gas prospect in Gondwana and in other sedimentary basins of the country for possible exploitation and its utilisation.

15. Development of technology for remote operations in underground coal mines

Flooding in active mines, subsidence, roof collapse and explosions are the major causes leading to fatal accidents and injuries of miners in underground coal mines.

Since, therefore is no off-the-shelf technology readily available to operate underground operations remotely, an integrated automated/remotely operated technology/system is required to be developed to monitor mine environment, roof strata conditions, monitoring and control of machineries deployed in underground on a peer-to-peer wireless backbone and, also tele operations, automated mapping on mine progress etc. to achieve 'Zero Accident Potential (ZAP)' in underground mines.

3.0 Information to be furnished by interested agencies:

- i) Company/Institute profile covering its name, location, nature / area of operation, past experience, available key personnel along with their CVs.
- ii) Infrastructural resources available and R&D set-up, manufacturing set up etc.

4.0 EoI should include the following :

- i) Proposed methodology for investigating the defined problem or undertaking required field trials.
- ii) Equipment to be deployed and layout of trials to be undertaken
- iii) Details of activities along with duration and manpower
- iv) Proposed collaboration / tie -up with other agencies

5.0 While preparing the EoIs, the organization should give due consideration to the statutory rules, and regulations of Directorate General of Mines Safety (DGMS) and other statutory bodies as applicable for such research work.

- 6.0** Interested organizations should submit their Expression of Interest (Eoi) in sealed envelope within a month of the date of publication, clearly marked "Expression of Interest for R&D Studies" to the following address :

General Manager (S&T)
CMPDI,
Gondwana Place, Kanke Road
Ranchi - 834 008
Jharkhand
Fax No. (0651) 2231148
Web: <http://www.cmpdi.co.in>

- 7.0** CMPDI may seek additional information from the interested party(ies) following submission of Eoi. However, CMPDI reserves the right of rejections/accepting the Eoi or inviting fresh Eoi, if so required
- 8.0** A pre-selection meeting may be organized for effective interaction with qualified, experienced and interested organizations for clarification of doubts, details of scope of work, etc. The date and venue for the same will be intimated after the Eoi are assessed by CMPDI.
- 9.0** Following such discussions, short - listing of agencies may be done and detailed proposals, including fund requirement, will be invited for further consideration.
