

S&T
Annual Report
वार्षिक प्रतिवेदन
2015-16

Government of India
Ministry of Coal
New Delhi 110 001

Central Mine Planning & Design Institute Limited
A Miniratna Company
(A Subsidiary Company of Coal India Limited)
Gondwana Place, Kanke Road, Ranchi 834 031

प्राक्कथन

कोयला उद्योग के सम्पूर्ण विकास के लिये संगठित अनुसंधान 1975 में सरकार का योजनाबद्ध कार्यक्रम "कोयला विज्ञान एवं प्रौद्योगिकी योजना" के बाद ही प्रारम्भ हुआ। इसने कोयला ग्रंथेक्षण से लेकर खनन के पश्चात पर्यावरणिक विषय तक में व्यापक रूप से अनुसंधान एवं विकास के क्रियाकलापों को सक्षम बनाया है।

सेंट्रल माइन प्लानिंग एण्ड डिजाइन इंस्टीच्यूट लिमिटेड (सी एम पी डी आई एल), कोयला विज्ञान एवं प्रौद्योगिकी परियोजना के समन्वयन एवं मॉनीटरिंग के लिये नोडल एजेंसी है।

वर्तमान में कोयला विज्ञान एवं प्रौद्योगिकी कार्यक्रम का संचालन स्थायी वैज्ञानिक अनुसंधान समिति (एस एस आर सी) नामक एक शीर्ष वैज्ञानिक निकाय द्वारा किया जाता है। एस एस आर सी को कोयला अनुसंधान के निम्नलिखित तीन महत्वपूर्ण क्षेत्रों से संबंधित उप समिति द्वारा सहायता प्रदान की जाती है, ये हैं :

- उत्पादन, उत्पादकता एवं सुरक्षा
- कोयला परिष्करण एवं उपयोग
- पर्यावरण एवं पारिस्थितिकी

1975 से कोयला एवं लिग्नाइट उत्पादक कम्पनियों की सक्रिय सहभागिता के साथ कोयला एवं सम्बद्ध उद्योगों से संबंधित राष्ट्रीय अनुसंधान एवं शैक्षणिक संस्थाओं कोयला मंत्रालय के विज्ञान एवं प्रौद्योगिकी अनुदान के तहत वर्तमान में अनुसंधान परियोजनाएँ क्रियावित की जा रही हैं। इसके परिणामस्वरूप 31.03.2016 तक 265 करोड़ रुपये की अनुमानित लागत से 314 परियोजनाएँ पूरी की जा चुकी हैं। कुछ परियोजनाओं की अनुसंधान उपलब्धियों का गवेषण, खनन पर्यावरण, कोयले की धुलाई, उपयोग प्रौद्योगिकी के क्षेत्र में उद्योग पर महत्वपूर्ण प्रभाव पड़ा है।

इस वार्षिक रिपोर्ट में विवेच्य वर्ष के दौरान 18 चालू परियोजनाएँ एवं 01 पूरी की जा चुकी परियोजना की स्थिति को दर्शाया गया है।

आशा है, यह पुस्तिका कोयला तथा इससे संबंधित उद्योगों में लगे सभी अनुसंधान कर्मियों, माइन प्लानरों/डिजाइनरों के लिये उपयोगी होगी।

भविष्य में संस्करण को समृद्ध बनाने के लिये प्रस्तुति एवं विषयवस्तु के प्रकाशन में सुधार लाने हेतु आपके महत्वपूर्ण सुझावों का स्वागत है।

स्थान : राँची



(शेखर सरन)

अध्यक्ष-प्रबंध निदेशक

INDEX

| Sl. No. | Name of Project | Code No. | Impl. Agency | Page No. |
|---------|--|--------------|---|----------|
| 1. | Development of tele robotics and remote operation technology for underground coal mines | MT (EoI)/162 | CEMRI, Durgapur, CIMFR, Dhanbad and CMPDI, Ranchi | 1 – 2 |
| 2. | Enhancing life of de-watering pipes in coal/lignite mines by prevention of erosion – corrosion with nano-crystalline surface engineering treatments | MT/163 | NLC, Neyveli University, Chennai & SCCL, Kothagudem | 3 – 5 |
| 3. | Blast design and fragmentation control – key to productivity | MT/164 | CIMFR, Dhanbad | 6 – 13 |
| 4. | Assessment of horizontal stress fields in deeper horizons and development of roof hazards maps of coal resources in SCCL | MT/165 | SCCL, Kothagudem & NIRM, Kolar | 14 – 15 |
| 5. | Techno-economic Evaluation and performance behavior of Self Advancing (mobile) Goaf Edge Supports (SAGES) (Phase – II) | MT/166 | ISM, Dhanbad & M/s. JBEPL, Hyderabad | 16 – 17 |
| 6. | Investigation pertaining to geotechnical & hydrogeological aspects to stabilize the noncohesive granular soil/sand in the opencast mines adjacent to the major perennial river | MT/167 | RI – IV, CMPDI Nagpur, Indian Institute of Technology (IIT), Mumbai and WCL, Nagpur | 18 – 19 |
| 7. | Shale gas potentially evaluation of Damodar Basin of India | CE (EoI)/30 | NGRI, Hyderabad, CIMFR, Dhanbad & CMPDI, Ranchi | 20 – 26 |
| 8. | CBM reserves estimation for Indian Coalfields | CE(EoI)/31 | IEST, Shibpur, TCE, Kolkata, CMPDI, Ranchi & NGRI, Hyderabad | 27 – 30 |
| 9. | Capacity building for extraction of CMM resource within CIL command areas | CE/32 | CMPDI, Ranchi & CSIRO, Australia | 31 – 32 |

LIST OF COAL S&T PROJECT COMPLETED DURING 2015-16

| Sl. No. | Name of Project | Code No. | Impl. Agency | Page No. |
|---------|---|----------|--------------------|----------|
| 1. | Modeling of airborne dust in opencast mines | EE/43 | NITK, Surathkal | 52 - 54 |

Production, Productivity & Safety

**S&T Annual Report
2015-16**

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Development of Tele robotics and Remote Operation Technology for Underground Coal Mines |
| 2. | Date of Start | : | September 2012 |
| 3. | Scheduled date of Completion | : | August 2016 |
| 4. | Implementing Agency | : | (i) CMERI, Durgapur (ii) CIMFR, Dhanbad |
| 5. | Sub –implementing Agency | : | CMPDIL, Ranchi |
| 6. | Project Co-ordinators | : | (i).Dr. S. Majumder, CMERI, Durgapur (ii).Dr. R. Singh, CIMFR, Dhanbad |
| 7. | Project leaders | : | (i). Dr. A. Maity, CIMFR, Dhanbad (ii).Dr. P.K. Mandal, & Dr. P.K. Mishra |
| 8. | Total Approved Cost | : | Rs. 440.12 lakh For CMERI - Rs. 251.57 lakh For CIMFR - Rs. 125.55 lakh For CMPDI - Rs. 63.00 lakh |

DESCRIPTION OF THE PROJECT

9. Objectives :

To develop Mobile Robot Technology for Tele-operation for on-line monitoring of mine environment, roof strata conditions including automated mapping on mine progress. The proposed on-line monitoring system will provide various environmental and strata control parameters from an underground coal mine to take immediate steps by the mine management in case of any abnormalities observed during the monitoring period.

10. Status as on 31.03.2016 :

The proposed model of the robot has already been developed by CMERI, Durgapur and lab-scale trials have been conducted at Khottadih mine of ECL. Further field trial will again be conducted after necessary modifications in the robot design and fine tuning the developed robot.

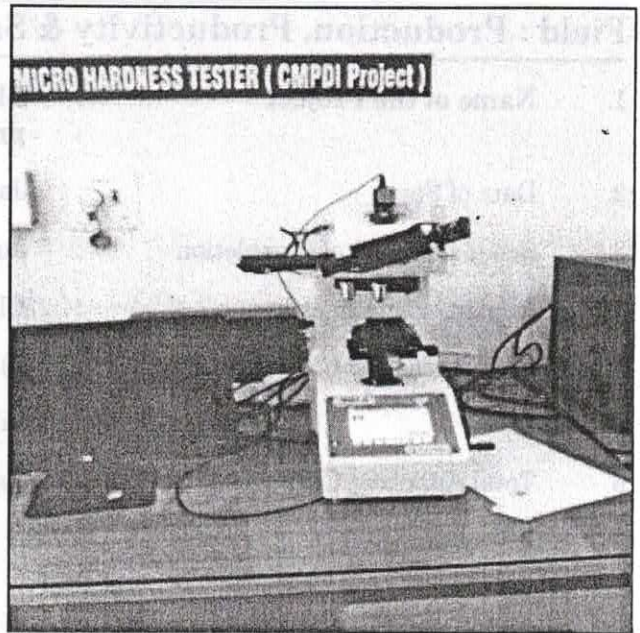
1. **Name of the Project** : **Enhancing life of de-watering pipes in coal/ lignite mines by prevention of erosion- corrosion with nano crystalline surface engineering treatments**
2. **Date of Start** : **September 2012**
3. **Scheduled date of Completion** : **August 2016**
4. **Implementing Agency** : (i) NLC, Neyveli
(ii) NITT, Tiruchirappalli
5. **Project Co-ordinators** : (i) Sri S. Chokkuvel Murugan, GM, NLC
(ii) Dr. S. Natarajan, NITT
6. **Project leaders** : (i) Sri M. Kumarasamy, CM/Mechanical, NLC
(ii) Dr. S.P. Kumaresh Babu, NITT
7. **Total Approved Cost** : **Rs. 293.99 lakh**
For NLC - Rs. 78.68 lakh
For NITT - Rs. 215.31 lakh

DESCRIPTION OF THE PROJECT

- | 8. | Objectives : | Activity |
|----|--------------|--|
| | NLC | |
| | (i) | To establish the basic causes for the erosion-corrosion of pipelines in mines. |
| | (ii) | To assess corrosive environment and the Corrosion process mechanisms. |
| | (iii) | To develop appropriate erosion-corrosion models for different environment and their correlation. |
| | (iv) | To evolve suitable materials for surface treatment for critical portions of dewatering pipes with proper methodology in association with NITT. |
| | (v) | Field Evaluation of the measures and cost economics. |



High Energy Planetary Ball Mill — MT/163

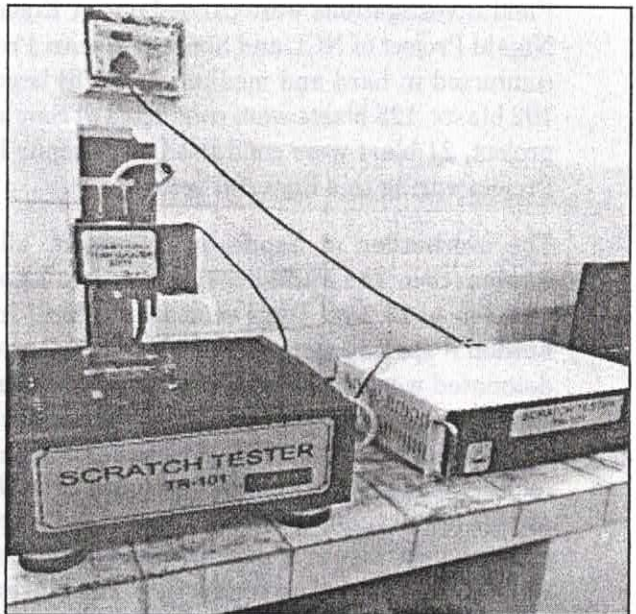


Micro Hardness Tester — MT/163

DESCRIPTION OF THE PROJECT



Water - Jet Erosion Tester — MT/163



Scratch Tester — MT/163

(TLD) and Down-the-hole (DTH) used at shovel bench blasting and are presented in Table 1 which shows the excessive scattering in the TLD of 17ms, 25ms and DTH-250ms.

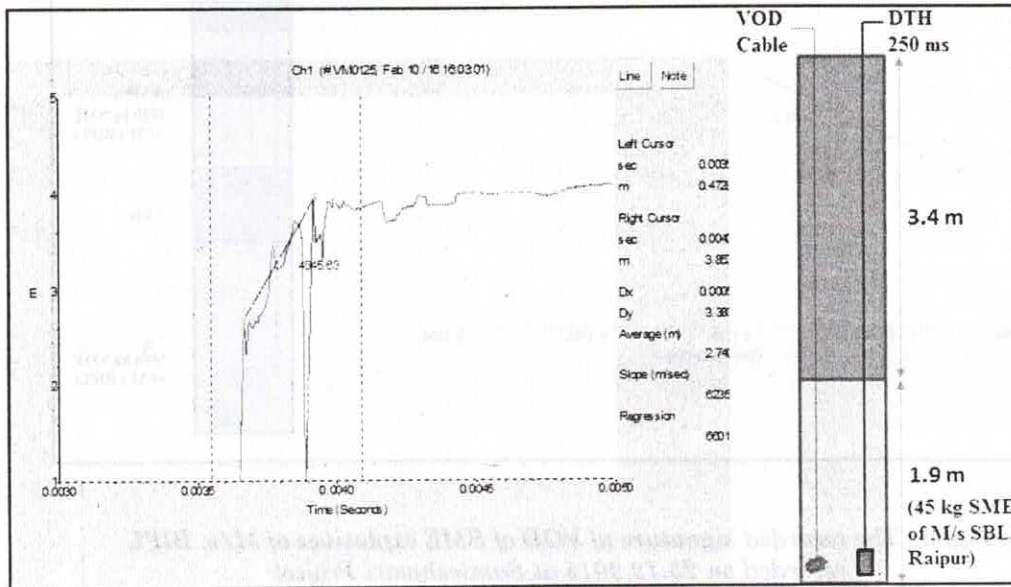


Fig. 1 : The recorded signature of VOD of SME explosives of M/s. SBL recorded on 10.02.2016 at Samleshwari Project

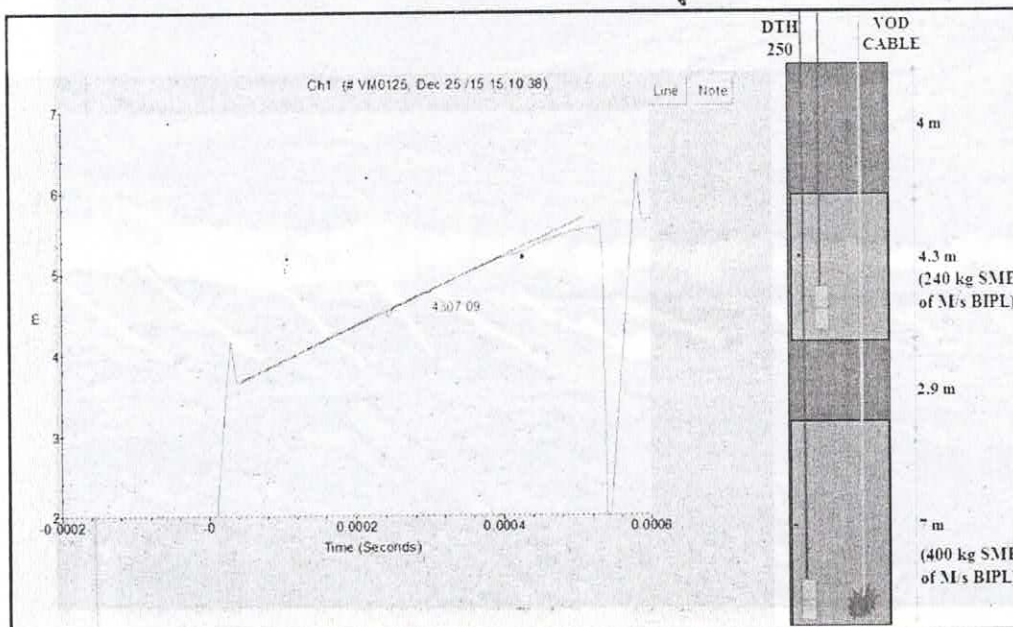


Fig. 2 : The recorded signature of VOD of SME explosives of M/s. BIPL recorded on 25.12.2015 at Samleshwari Project

Table 1

Recorded delay detonators scattering test results at Samleshwari Project, MCL

| Samleshwari OCP, MCL | | | | | |
|----------------------|-----------|-------------------------|-------------------------|-----------------|-----------------|
| Date of Recording | Delays | Design Firing Time [ms] | Actual Firing Time [ms] | Scattering [ms] | % of scattering |
| 26.12.2015 | TLD-17ms | 17 | 8 | -9 | -52.9 |
| 26.12.2015 | TLD-17ms | 17 | 12 | -5 | -29.4 |
| 26.12.2015 | TLD-17ms | 17 | 0 | -17 | -100.0 |
| 26.12.2015 | TLD-25ms | 25 | 24 | -1 | -4.0 |
| 26.12.2015 | TLD-25ms | 25 | 0 | -25 | -100.0 |
| 26.12.2015 | TLD-25ms | 25 | 16 | -9 | -36.0 |
| 26.12.2015 | DTH-225ms | 225 | 276 | 51 | 22.7 |
| 26.12.2015 | DTH-225ms | 225 | 296 | 71 | 31.6 |
| 26.12.2015 | DTH-250ms | 250 | 260 | 10 | 4.0 |
| 26.12.2015 | DTH-250ms | 250 | 164 | -86 | -34.4 |

The overburden at Kusmunda project in all the benches are being operated by shovel-dumper combination. The average explosives in a blast holes varied from 151 kg to 539 kg having hole depth of 10 m to 20 m. The burden \times spacing were of 5.8 m \times 6.2 m, 6 m \times 6.5 m, 6.2 m \times 6.8 m, 6.8 m \times 7 m, 7 m \times 7.5 m, 7.2-7.3 m \times 7.5-7.8 m. The quality test of boosters, explosives and blasting accessories (particularly MS connectors, detonating fuse and cord relays) were carried out before conducting trial blasts. The delay detonators scattering tests were performed at Kusmunda project for MS connectors, cord relays and Down-the-hole (DTH) used at shovel bench blasting and are presented in Table 2 which shows the excessive scattering in the MS connectors of 17ms, cord relays of 50ms and DTH-450ms. The recorded signature of VOD of Solardet cast booster-100g (8094 m/s) on 23.04.2015 and is presented in Figure 5. Figure 6 depicts the VOD trace of detonating fuse of M/s AEC recorded at Kusmunda project. In-the-hole VOD of SME explosives of M/s IOCL-IBP recorded at 702 drill bench of Kusmunda project on 04.05.2015 was 4452 m/s (bottom deck) and 4647 m/s (top deck) and is presented in Figure 7.

Table 2

Recorded delay detonators scattering test results at Kusmunda Project, SECL

| Date of Recording | Delays | Design Firing Time [ms] | Actual Firing Time [ms] | Scattering [ms] | % of scattering |
|-------------------|-----------|-------------------------|-------------------------|-----------------|-----------------|
| 21.04.2015 | MSC-17ms | 17 | 36 | 19 | 111.8 |
| 21.04.2015 | MSC-17ms | 17 | 39 | 22 | 129.4 |
| 21.04.2015 | MSC-17ms | 17 | 35 | 18 | 105.9 |
| 21.04.2015 | MSC-17ms | 17 | 38 | 21 | 123.5 |
| 21.04.2015 | MSC-42ms | 42 | 48 | 6 | 14.3 |
| 21.04.2015 | MSC-42ms | 42 | 48 | 6 | 14.3 |
| 21.04.2015 | MSC-42ms | 42 | 48 | 6 | 14.3 |
| 21.04.2015 | MSC-42ms | 42 | 49 | 7 | 16.7 |
| 21.04.2015 | CR-50ms | 50 | 50 | 0 | 0.0 |
| 21.04.2015 | CR-50ms | 50 | 37 | -13 | -26.0 |
| 21.04.2015 | CR-50ms | 50 | 47 | -3 | -6.0 |
| 03.05.2015 | MSC-17ms | 17 | 44 | 27 | 158.8 |
| 03.05.2015 | MSC-17ms | 17 | 34 | 17 | 100.0 |
| 03.05.2015 | MSC-17ms | 17 | 18 | 1 | 5.9 |
| 03.05.2015 | MSC-17ms | 17 | 44 | 27 | 158.8 |
| 03.05.2015 | MSC-17ms | 17 | 28 | 11 | 64.7 |
| 03.05.2015 | MSC-17ms | 17 | 42 | 25 | 147.1 |
| 03.05.2015 | MSC-17ms | 17 | 20 | 3 | 17.6 |
| 03.05.2015 | MSC-17ms | 17 | 2 | -15 | -88.2 |
| 03.05.2015 | MSC-17ms | 17 | 30 | 13 | 76.5 |
| 03.05.2015 | MSC-17ms | 17 | 30 | 13 | 76.5 |
| 03.05.2015 | MSC-17ms | 17 | 34 | 17 | 100.0 |
| 03.05.2015 | MSC-17ms | 17 | 30 | 13 | 76.5 |
| 03.05.2015 | MSC-42ms | 42 | 28 | -14 | -33.3 |
| 03.05.2015 | MSC-42ms | 42 | 38 | -4 | -9.5 |
| 03.05.2015 | MSC-42ms | 42 | 32 | -10 | -23.8 |
| 03.05.2015 | DTH-450ms | 450 | 424 | -26 | -5.8 |
| 03.05.2015 | DTH-450ms | 450 | 430 | -20 | -4.4 |
| 03.05.2015 | DTH-450ms | 450 | 426 | -24 | -5.3 |
| 03.05.2015 | DTH-450ms | 450 | 432 | -18 | -4.0 |
| 03.05.2015 | DTH-450ms | 450 | 520 | 70 | 15.6 |
| 03.05.2015 | DTH-450ms | 450 | 450 | 0 | 0.0 |
| 03.05.2015 | DTH-500ms | 500 | 484 | -16 | -3.2 |
| 03.05.2015 | DTH-500ms | 500 | 496 | -4 | -0.8 |
| 03.05.2015 | DTH-500ms | 500 | 478 | -22 | -4.4 |
| 03.05.2015 | DTH-500ms | 500 | 526 | 26 | 5.2 |
| 03.05.2015 | DTH-500ms | 500 | 484 | -16 | -3.2 |
| 03.05.2015 | DTH-500ms | 500 | 476 | -24 | -4.8 |

9. Slippage, if any : NIL

10. Action Plan for 2016 -17 :

| Sl. No. | Activity | Date of Start | Date of Completion |
|---------|--|---------------|--------------------|
| 1 | Procurement of Equipment | July 2013 | March 2016 |
| 2 | Collection of explosives and rock samples, determination of their properties | July 2013 | March 2016 |
| 3 | Field investigation, Collection of data and experimentation | July 2013 | March 2016 |
| 4 | Compilation of data and their analysis and trial blasts | July 2013 | Continuing |
| 5 | Guidelines for blast design, explosives properties, fragmentation and productivity | July 2013 | Continuing |
| 6. | Report Preparation | March 2016 | Continuing |

9. Status as on 31.03.2016 :

Procurement of the equipment are under progress. Work order placed for drilling of two no. of boreholes at Mandamarri block B&C / RKNT dip side block. MoU signed between SCCL and NSRC, Hyderabad and NRSC has completed map reading for lineaments analysis to understand the stress distribution in the coal bearing formation of Godavary valley of SCCL.

10. Slippage, if any : NIL

11. Action Plan for 2016 -17 :

| Sl. No. | Activity | Date of Start | Date of Completion |
|---------|--------------------------------------|---------------|--------------------|
| 1 | Procurement of equipment | April 2016 | March 2017 |
| 2 | Drilling of boreholes | April 2016 | March 2017 |
| 3 | Stress measurement in existing areas | April 2016 | March 2017 |

10. Slippage, if any : NIL

11. Action Plan for 2016 -17 :

| Sl. No. | Activity | Date of Start | Date of Completion |
|---------|--|---------------|--------------------|
| 1 | Refurbishment and modifications in the SAGESs | April 2016 | July 2016 |
| 2 | Transportation of SAGES from JBEPL Hyderabad to RK-NT/RK-5 mine of SCCL and their deployment in the depillaring panels | August 2016 | November 2016 |
| 3 | Field trial of all the six SAGES in a mine with seam thickness 2.5 to 3 m and stone roof for full functional and economic performance evaluation of the SAGES. | December 2016 | November 2017 |
| 4 | Report preparation | December 2017 | December 2017 |

9. Status as on 31.03.2016 :

Tending for geo-technical investigations and hydrogeological investigations has been completed.

10. Slippage, if any : NIL

11. Action Plan for 2016 -17 :

| Sl. No. | Activity | Date of Start | Date of Completion |
|---------|---|----------------|--------------------|
| 1 | Literature survey | April 2016 | April 2016 |
| 2 | Procurement of Equipment | May 2016 | September 2016 |
| 3 | Geo-technical Investigation | August 2016 | November 2016 |
| 4 | Hydrogeological Investigation | August 2016 | December 2016 |
| 5 | Numerical Modelling | September 2016 | December 2016 |
| 6 | Detailed Design and drawing preparation | January 2017 | March 2017 |

- > Collected shale samples will be analysed for total organic content and their characterization, maturity of organic matter through TOC, pyrolysis test and isotopic measurements at NGRI geochemical lab.
- > To measure petro physical properties (density, porosity, shear and compressional wave velocities) of sedimentary rocks from the deep boreholes and supplement the measurements in the geophysical modeling of the gas bearing shale beds.

9. Status as on 31.03.2016 :

- i. Carried out detailed literature survey for shale occurrence and depositional conditions in Damodar valley coalfields such as Jharia, Raniganj, East Bokaro and North-south Karanpura coalfield.
- ii. Continuous shale core sampling done at Mahuda, Singra and Kapuria in Jharia and Dharma, Madhukunda, South Central Salanpur in Raniganj basins in promotional running boreholes focusing Raniganj, Barren Measures and Barakar Formations.
- iii. Investigated megascopic properties of shale core samples and processed shale samples for different analysis.

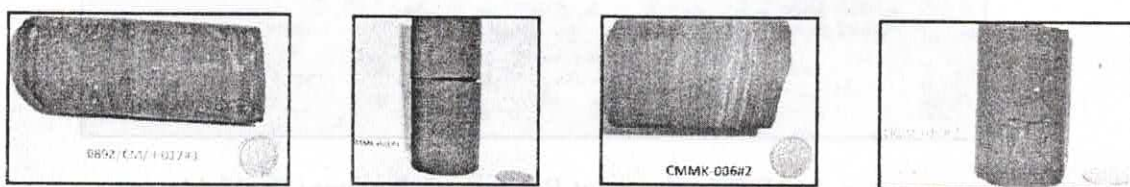


Fig. 1 : Megascopic photographs of the shale core samples obtained from aforesaid blocks

- iv. Shale samples prepared for proximate, TOC, Pyrolysis, SEM and EDAX, CHNS, XRD and others.
- v. Prepared 150 thin sections and 152 pellets of shale core samples in vertical as well as horizontal section for petrography and mineralogical studies.
- vi. Carried out detailed petrographic analysis for maceral volume percentage measurements and distribution of minerals/clays.

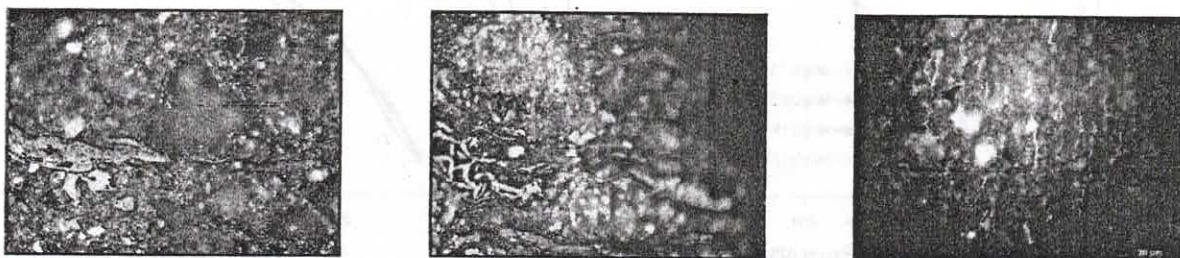


Fig. 2 : Micro petrographic photographs of shale core samples showing vitrinite, intertinite and liptinite maceral

xii. Carried out FTIR analysis of about 30 shale core samples.

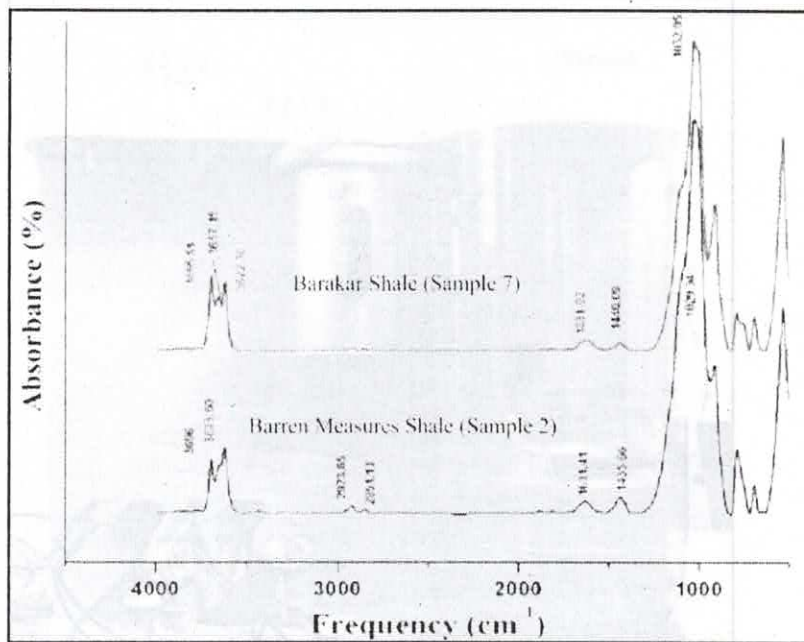


Fig. 5 : FTIR spectroscopy of Barren Measures and Barakar Formations

xiii. Carried out SEM analysis of 60 shale core samples.

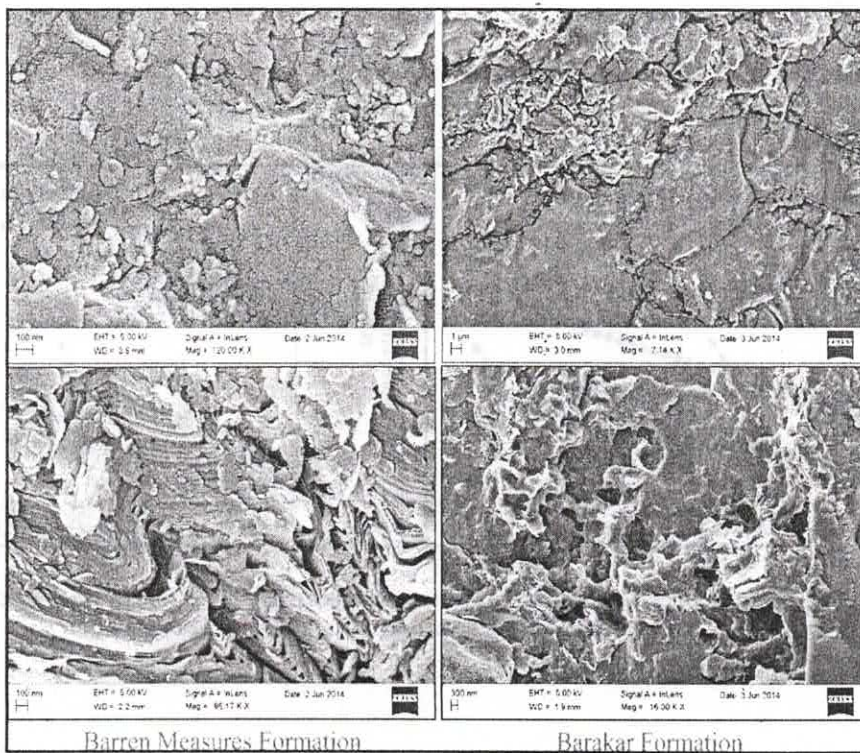


Fig. 6 : SEM photographs of Barren Measures and Barakar Formations

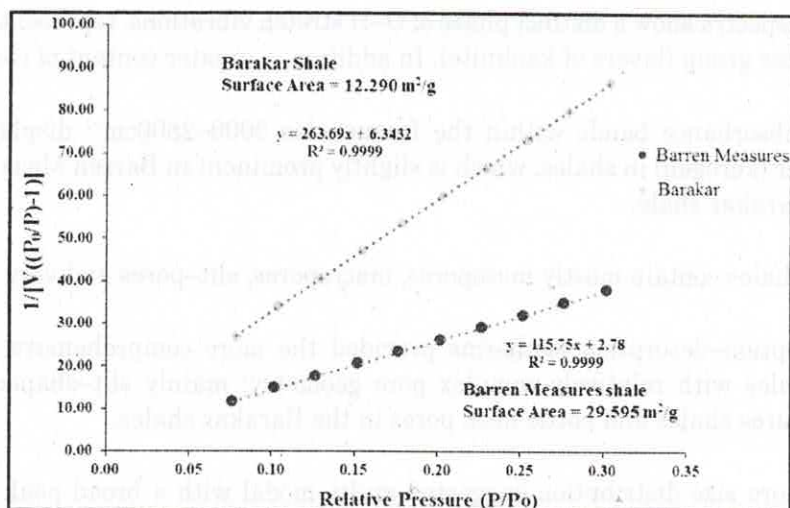


Fig. 9 : BET surface area plot of Barren Measures and Barakar shales

Summary of the immediate results :

Geochemical analyses such as proximate, pyrolysis, TOC and FTIR, and other analyses like surface area, pore size, pore volume (using low-pressure N₂ physisorption measurements) and SEM were performed on the shale samples derived from Early Permian Barakar and Late Permian Barren Measures formations of the Raniganj Coalfield, West Bengal. Rock-Eval pyrolysis and TOC data indicated that the heterogeneity of Barren Measures and Barakar shales is laterally varying, but in general, factors which support the occurrence of shale gas accumulations include a moderate to high TOC content (3.38–7.87 wt. %) with sufficient thermal maturity and type III–IV organic matters (kerogens). FTIR spectra indicate the presence of quartz and kaolinite with absorbance bandwidth between 1200–800 cm⁻¹ and 3750–3400 cm⁻¹, respectively. Abundance of quartz, as compared to clay, points towards the brittle characteristics of shales favourable for good fracability. Besides, mesopores and macropores are well-developed and the capacity of gas generation and adsorption are significant. The inferences drawn from the data generated on shales of the Early Permian Barakar and the Late Permian Barren Measures formations are complimentary to each other. The following conclusions are drawn with regard to the types of organic matter, thermal maturity and gas generating potentiality of the studied Lower Gondwana shales: The shales are composed predominantly of light and dark grey banded lithotypes; such bands are related to high ash yields. The volatile matter yields are in accordance with the maturity (calculated vitrinite reflectance: VR% of the shales).

- Significant amount of TOC contents, averaging 6.62 wt.% (in Barakar shale) and 5.59 wt.% (in Barren Measures shale), and pyrolysis data indicate that both the shale sequences are having potentiality of genesis of gas.
- Tmax and calculated VR% values suggest a low degree of organic matter transformation and evolution.
- Inter-relationships between the amount of hydrocarbons (S₂) and TOC, the hydrogen index (HI) and oxygen index (OI), the maximum temperature of pyrolysis (Tmax value) and HI, and between the calculated VR% and HI demonstrate the input of dominantly type III–IV admixed organic materials—a typical gas-prone kerogens.

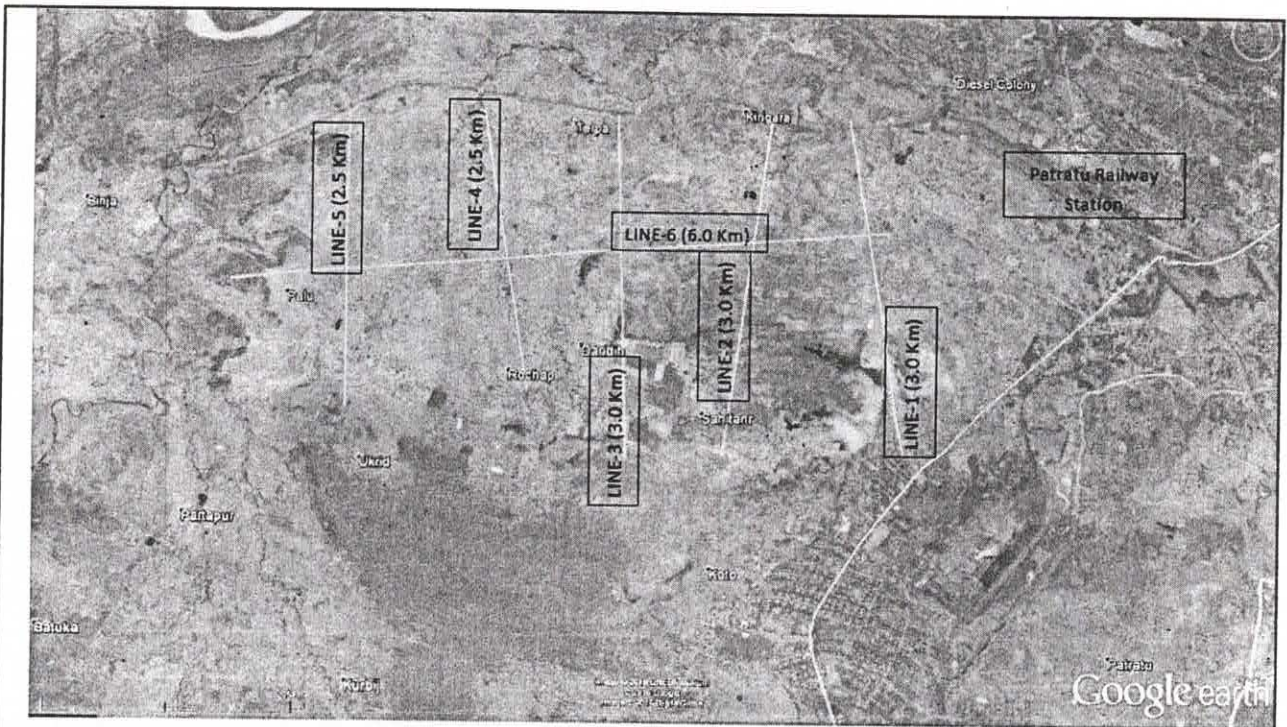
| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | CBM reserves estimation for Indian Coalfields |
| 2. | Date of Start | : | March 2014 |
| 3. | Scheduled date of Completion | : | March 2017 |
| 4. | Implementing Agency | : | IEST, Shibpur, |
| 5. | Sub-Implementing Agency | : | (i) CMPDI, Ranchi, (ii) TCE Limited, Kolkata (iii) NGRI, Hyderabad |
| 6. | Project leader /Co-ordinator | : | (i) Dr Pratik Dutta, BESU, Shibpur (ii) Dy. GM (CBM), CMPDIL, Ranchi (iii) Shri Ranjan Bhattacharya, TCE, Kolkata (iv) Dr. HVS Satyanaranayan, NGRI, Hyderabad |
| 7. | Total Approved Cost | : | Rs. 2069.91 lakh For IEST – Rs.763.12 lakh For NGRI – Rs.457.06 lakh For CMPDI – Rs. 592.73 lakh For TCE – Rs. 257.00 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

The objectives of the project are :

- (a) To generate an accurate geological model of a study area with associated coal Seams by 2D/3D seismic survey and acquisition of conventional surface / subsurface information and validation of the model by drilling core holes
- (b) To determine various in situ coal properties for coal characterization within the study area
- (c) To find out the in-situ gas content and establish adsorption isotherms for estimation of gas saturation



Tentative Coordinates of the proposed 2D seismic profiles:

| S.No. | Line No. | Starting Coordinates | Ending Coordinates | Note |
|-------|----------|-----------------------------|-----------------------------|--|
| 1 | Line-1 | 23°40'31.47" & 85°17'00.99" | 23°38'55.77" & 85°17'12.96" | The length and location of the proposed seismic lines may be differed during the data acquisition depending on the Line clearance in order to avoid local objections. The exact coordinates will be finalized during the field work before starting the data acquisition along each profile. |
| 2 | Line-2 | 23°40'33.06" & 85°16'37.98" | 23°38'57.59" & 85°16'16.24" | |
| 3 | Line-3 | 23°40'35.95" & 85°15'43.35" | 23°38'58.23" & 85°15'46.14" | |
| 4 | Line-4 | 23°40'39.30" & 85°15'03.90" | 23°39'18.49" & 85°15'16.00" | |
| 5 | Line-5 | 23°40'37.50" & 85°14'19.70" | 23°39'16.10" & 85°14'18.57" | |
| 6 | Line-6 | 23°39'54.23" & 85°13'53.40" | 23°39'58.47" & 85°17'14.02" | |

Fig. 1 : Location map for 2-D Seismic Survey Lines at site

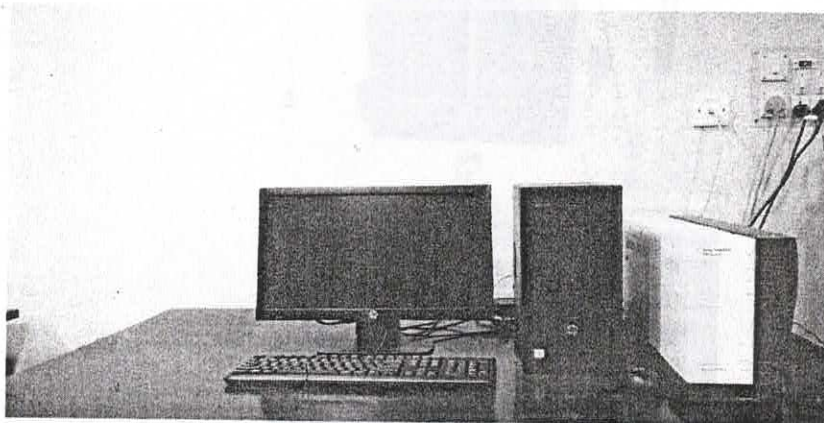


Fig. 2 : Micro-Gas Chromatograph — CE(EoI) – 31

| | | | |
|----|------------------------------|---|--|
| 1. | Name of the Project | : | Capacity building for extraction of CMM resource within CIL command areas |
| 2. | Date of Start | : | March 2016 |
| 3. | Scheduled date of Completion | : | March 2019 |
| 4. | Implementing Agency | : | CBM Cell, CMPDI, Ranchi |
| 5. | Sub-Implementing Agency | : | CSIRO, Australia |
| 6. | Project leader /Co-ordinator | : | (i) Mr. Rajiw Lochan/DGM (CBM), CMPDI, Ranchi (ii) Dr. Hua Guo/Dr. Rao Balusu, CSIRO, Australia |
| 7. | Total Approved Cost | : | Rs. 2392.79 lakh For CMPDI – Rs. 1492.72 lakh For CSIRO – Rs. 900.07 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- To develop efficient and cost-effective methane capture technologies at a pre-selected field or mine site under Indian resource and mining conditions.
- To develop advanced gas testing laboratory services and capabilities within CMPDI which may be replicated in at respective regional institutes of CMPDI associated with CIL subsidiaries.

9. Status as on 31.03.2016 :

Newly started project, literature survey is in progress.

Coal Beneficiation & Utilisation

**S&T Annual Report
2015-16**

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Development of indigenous catalyst through Pilot Scale Studies of Coal-To-Liquid (CTL) conversion technology |
| 2. | Date of Start | : | January 2010 |
| 3. | Scheduled date of completion | : | June 2016 |
| 4. | Implementing Agency | : | CIMFR, Dhanbad |
| 5. | Sub-Implementing Agency | : | GMPDI, Ranchi |
| 6. | Project Leader | : | Dr. Sudip Maity, Scientist/Director, CIMFR, Dhanbad |
| 7. | Total Approved Cost | : | Rs. 860.44 lakh |
| | | | For CIMFR – Rs. 743.54 lakh |
| | | | For CMPDI – Rs. 116.90 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- (i) developing suitable catalysts and to study the coal-to-liquid conversion technology in Pilot Scale in an integrated plant consisting of low cost air blown gasifier and a multi-tubular fixed bed reactor (Catalyst Capacity: 10.0 L)
- (ii) testing high ash Indian coals in the gasifier
- (iii) generating basic design & process parameters for further scale-up to commercialization
- (iv) characterizing the products (liquid and gaseous) and its up-gradation/processing for commercial use.

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Design and Development of truck mounted mobile coal sampler for instant coal ash & moisture analyzer at site from railway wagon/truck |
| 2. | Date of Start | : | August 2011 |
| 3. | Scheduled date of Completion | : | June 2016 |
| 4. | Implementing Agency | : | CIMFR, Dhanbad |
| 5. | Sub-Implementing agency | : | (i) M/s Pranay Enterprises, Hyderabad (ii) SCCL, Kothagudem |
| 6. | Project leader /Co-ordinator | : | Dr. Sudhir Kumar Kashyap, Principal Scientist, CIMFR, Dhanbad |
| 7. | Total Approved Cost | : | Rs. 167.60 lakh For CIMFR – Rs. 8.85 lakh For M/s Pranay Entp. – Rs. 158.75 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

Phase – I : To establish the feasibility of nuclear techniques method with dual – gamma ray transmission for analysis of coal for ash and moisture content.

Phase – II : To design & develop a Truck mounted mobile coal sampler for instant coal ash & moisture analyzer at site from railway wagon/truck

9. Status as on 31.03.2016 :

Phase - I study completed and project completion report submitted. Under the project, it was

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Development of an on-line Coal Washability Analyser |
| 2. | Date of Start | : | March 2014 |
| 3. | Scheduled date of Completion | : | March 2017 |
| 4. | Implementing Agency | : | CIMFR, Dhanbad |
| 5. | Sub-Implementing agency | : | M/s Ardee Hitech Pvt. Ltd., Visakhapatnam |
| 6. | Project leader /Co-ordinator | : | (i) Mr. K.M.P. Singh, CIMFR, Dhabad (ii) Dr. S. A. Khayyom, M/s Ardee Hi-tech Pvt. Ltd., Vishakhapatnam (iii) Mr. T. Gouri Charan, CIMFR, Dhanbad |
| 7. | Total Approved Cost | : | Rs. 849.00 lakh For CIMFR – Rs. 505.80 lakh For Ardee Hitech – Rs. 343.20 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- (i) To develop a X –ray based, online coal washability analyzer and demonstrate the capabilities of the analyzer by comparing efficiency data from traditional float-sink tests with efficiency data generated by the washability analyzer.
- (ii) To develop a laboratory scale model initially to establish the concept and derive the required parameters and to develop suitable software.

The second phase the system may be upgrade for online operations

9. Status as on 31.03.2016 :

Laboratory model installed at CIMFR, Dhanbad. Identified samples were tested by Float and Sink method as well as in the existing sensor. It was found that there was a variation in density and ash percentage with the experimented data. Data analysis for different particles and software modifications are in progress based on the experimental data. Proposed construction and Procurement of equipment is under progress.

10. Slippage, if any : Delay in procurement of Equipment.

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Optimization of various parameters of lab coal winnowing System (Phase - II) |
| 2. | Date of Start | : | December 2015 |
| 3. | Scheduled date of Completion | : | September 2016 |
| 4. | Implementing Agency | : | CIMFR, Nagpur Unit, Nagpur |
| 5. | Sub-Implementing agency | : | CMPDI, Ranchi |
| 6. | Project leader /Co-ordinator | : | (i) Sri Devendra Kumar Sakhare, Senior Scientist, CIMFR Nagpur Unit – II, Nagpur (ii) Dr. Shripal Singh, Scientist-in-Charge, CIMFR Nagpur Unit – II, Nagpur (iii) General Manager (CMP), CMPDI, Ranchi |
| 7. | Total Approved Cost | : | Rs. 18.55 lakh For CIMFR, Nagpur – Rs. 12.55 lakh For CMPDI – Rs. 6.00 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- (i) Optimization of various parameters of lab scale 'Coal winnowing system' for consistency in product yield and ash of various coals from different coalfields.
- (ii) Determination of ash, moisture and GCV of product & rejects of each samples and segregation of the coal samples and rejects, based on the Gross Calorific Value (GCV) and segregation of the coal and rejects, based on the GCV.

9. Status as on 31.03.2016 : °

Crushing, screening and size analysis have been done for the coal samples collected from WCL mines. Float & sink tests of 50-25 mm, 25-13 mm, 13-6 mm and 6-0.5mm completed. 40 HP high

1. **Name of the Project** : Sustainable livelihood activities on reclaimed open cast coal mines: a technology enabled integrated approach in Indian coal sector
2. **Date of Start** : March 2015
3. **Scheduled date of Completion** : March 2018
4. **Implementing Agency** : TERI / TERI University, New Delhi
5. **Sub – implementing Agency**
 - (i) CMPDI, Ranchi
 - (ii) MCL
6. **Project leader /Co-ordinator** :
 - (i) Professor Arabinda Mishra, TERI University
 - (ii) Shri D. Basu, General Manager (Env), CMPDI, Ranchi
7. **Total Approved Cost** : Rs. 371.69 lakh
 - For TERI - Rs. 290.69 lakh
 - For CMPDI - Rs. 81.00 lakh

DESCRIPTION OF THE PROJECT

8. Objectives :

- (i) To assess, through the application of a systematic multi-criteria evaluation framework, the suitability potential of post-mining land use for ecologically beneficial and socio-economically productive outcomes.
- (ii) To develop permanent green cover on overburden dumps/backfilled mined land area using mycorrhiza and various plant species of economic importance.
- (iii) To develop entrepreneurship and vocational skills among members of local Self Help Groups (SHGs) for community (with a focus on women and other weaker sections of the society) empowerment through access to new economic opportunities.

In addition to the above; the proposal also aims to build capacity among University students for

| | | | |
|----|------------------------------|---|--|
| 1. | Name of the Project | : | Assessment of mine water environment and development of suitable and cost effective mine void aqua eco-system for promoting Fish culture in abandoned coal quarries of CIL |
| 2. | Date of Start | : | March 2015 |
| 3. | Scheduled date of Completion | : | March 2018 |
| 4. | Implementing Agency | : | BAU, Ranchi |
| 5. | Sub implementing Agency | : | CMPDI, Ranchi |
| 6. | Project leader /Co-ordinator | : | (i) Dr A.K.Singh, BAU, Ranchi (ii) General Manager (Envn.), CMPDI, Ranchi |
| 7. | Total Approved Cost | : | Rs. 224.27 lakh For BAU, Ranchi – Rs.157.27 lakh For CMPDI – Rs.67.0 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- (a) Study of physico-chemical and biological parameters (soil and water) of coal quarries
- (b) Improvement of water quality through biological method for suitability of fish culture.
- (c) Selection of suitable fish species and fish culture techniques.
- (d) Study of economics and to develop a suitable and cost effective method for income generation through fish culture.
- (e) Development of a guideline for further use of coal quarry for fish culture.

9. Status as on 31.03.2016 :

Sangam OCP and Saunda AK of CCL have been selected for the study. Procurement of the equipment are under progress. Samples from the Sangam quarry were collected and analysis is under progress.

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Construction structure on backfilled opencast coal mines : An attempt to suggest viable methodologies |
| 2. | Date of Start | : | December 2015 |
| 3. | Scheduled date of Completion | : | March 2018 |
| 4. | Implementing Agency | : | ISM, Dhanbad & Civil Deptt., CMPDI, Ranchi |
| 5. | Sub implementing Agency | : | |
| 6. | Project leader /Co-ordinator | : | (i) Prof. Sekhar Chandra Dutta, ISM, Dhanbad (ii) General Manager (Civil), CMPDI, Ranchi |
| 7. | Total Approved Cost | : | Rs. 338.32 lakh For ISM – Rs.304.12 lakh For CMPDI – Rs.34.20 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- (i) To study the feasibility of constructing habitations and other infrastructural facilities on back filled opencast mines.
- (ii) To frame a guidelines such that the structures with adequate foundation can be constructed on backfilled opencast mines all over India.

9. Status as on 31.03.2016 :

Jagannath and Bharatpur OCP have been selected for the study. Disturbed soil samples collected from selected locales and analysis is in progress.

10. Slippage, if any : NIL

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | On-line coal dust suppression system for opencast mines |
| 2. | Date of Start | : | March 2016 |
| 3. | Scheduled date of Completion | : | September 2018 |
| 4. | Implementing Agency | : | C-DAC, Thiruvananthapuram & CMPDI, Ranchi |
| 5. | Sub implementing Agency | : | ME Deptt., CMPDI, Ranchi |
| 6. | Project leader /Co-ordinator | : | (i) Dr. S. Rominus Valsalam, C-DAC (T) (ii) General Manager (ME), CMPDI (HQ), Ranchi |
| 7. | Total Approved Cost | : | Rs. 421.04 lakh For C-DAC – Rs.361.04 lakh For CMPDI – Rs.60.00 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- To identify air pollutants present in opencast coal mines and provide centralised online monitoring of inventory of the pollutants (PM₁₀, PM_{2.5}, SO₂, NO₂ and CO) based on National Ambient Air Quality Standard (NAAQS).
- To develop an automatic dust suppression system for the dust generated during transportation activities in opencast coal mines for regulating the amount of particulate matter PM₁₀ and PM_{2.5} present in the air based on NAAQS standard by sprinkling of adequate quantity of water.

Environment & Ecology

**S&T Annual Report
2015-16**

| | | | |
|----|------------------------------|---|---|
| 1. | Name of the Project | : | Possible implication of bioavailable iron in coal mine dust on coal workers' lung disease |
| 2. | Date of Start | : | March 2016 |
| 3. | Scheduled date of Completion | : | September 2018 |
| 4. | Implementing Agency | : | NIMH, Nagpur |
| 5. | Sub implementing Agency | : | (i) PIET, Nagpur |
| | | | (ii) CIIMS, Nagpur |
| | | | (iii) WCL, Nagpur |
| 6. | Project leader /Co-ordinator | : | Dr. Shubhangi Pingle, Head Department of Biochemistry, NIMH, Nagpur |
| 7. | Total Approved Cost | : | Rs. 96.54 lakh |
| | | | For NIMH – Rs.57.28 lakh |
| | | | For PIET – Rs. 20.33 lakh |
| | | | For CIIMS – Rs.18.93 lakh |

DESCRIPTION OF THE PROJECT

8. Objectives :

- To study detailed profiling and characterization of bioavailable iron in the coal samples and in respirable coal dust particles of various coal mining regions of central India.
- To develop in vitro model using human lung cell line and in vivo model using animal for pneumoconiosis disease by exposing different dose time interval of bioavailable iron coal dust or respirable coal dust particle.

S&T Completed Project during 2015-16

**S&T Annual Report
2015-16**

1. **Name of the Project** : **Modeling of Airborne dust in opencast coal mines**
2. **Date of Start** : **August 2011**
3. **Scheduled date of Completion** : **July 2015**
4. **Implementing Agency** : **NIT , Suratkhhal**
5. **Project leader /Co-ordinator** : **Prof. (Dr.) V R Sastry, NIT, Suratkhhal**
6. **Total Approved Cost** : **Rs. 77.04 lakh**

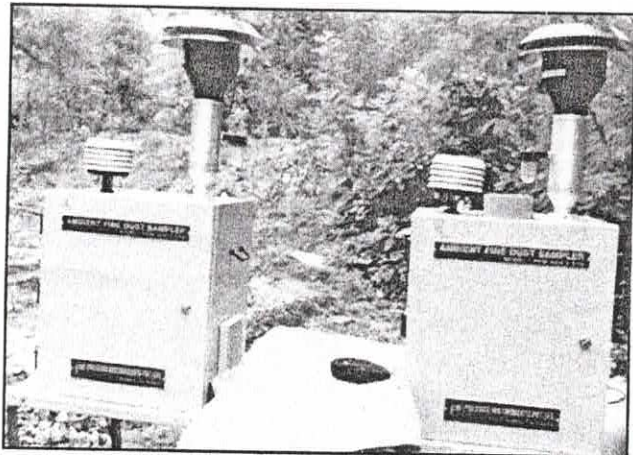
DESCRIPTION OF THE PROJECT

7. Objectives :

To analyze the dust generation from different sources and dispersion in terms of different particulate matter at various places and horizons, and develop a model based on the field data to predict dust concentration and software appropriate for Indian metrological and mining conditions for devising effective mitigation measures.

8. Work Done :

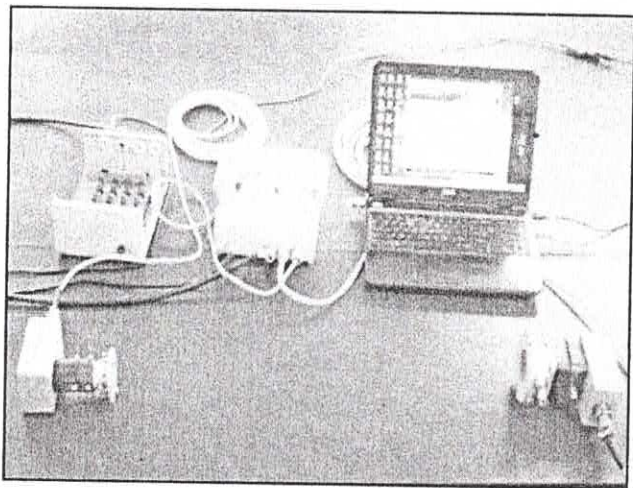
- ❖ Three opencast coal mining projects were selected for carrying out scientific studies. The first one was Prakasam Khani Opencast-II project of the Singareni Collieries Company Limited, Manuguru, Khammam District in Telangana State and the other two opencast mines are in Mahanadi Coalfields Limited (MCL), namely Bhuvaneshwari Open cast project in Jagannath Area of Talcher Coalfields and Shamleshwari Open cast project in IB Valley Area
- ❖ Dust monitoring was carried out from different sources like –drilling, blasting, loading haul roads, dumping and coal handling plant using different equipment like Personal Dust Monitors, Dust Dosimeters, Soiling Rate Measurement System, Point Samplers, Dust Deposit Scan and Dust Gauge Monitoring System Unit and Opacity Meter.
- ❖ Meteorological conditions pertaining to temperature, relative humidity, wind speed and direction of wind and solar insolation parameters were monitored using Meteorological Weather Monitoring Station



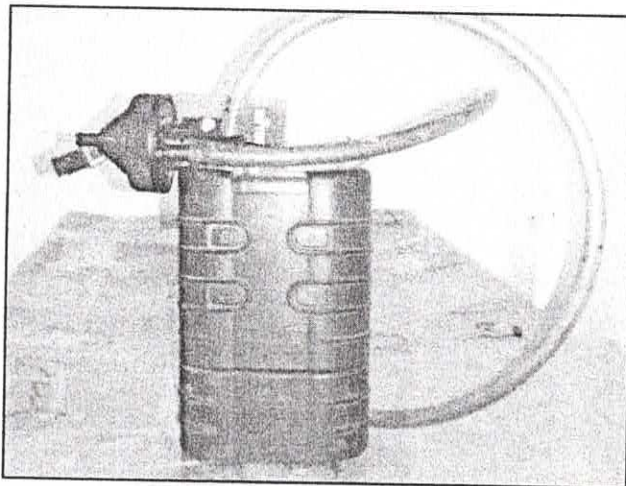
Ambient Point Sampler — EE/43



BETA Attenuation Monitor - BAM-1020 — EE/43



Dust Opacity Meter Set -up — EE/43



Dust Dosimeter Set u- up — EE/43