

S & T ANNUAL REPORT

वार्षिक प्रतिवेदन

2008-09



Indigenously developed 4 x 800T Chock Shield
under S&T Grant of Ministry of Coal

Government of India
Ministry of Coal
New Delhi 110 115

Central Mine Planning & Design Institute Limited

A Miniratna Company

(A Subsidiary of Coal India Limited)

Gondwana Place, Kanke Road, Ranchi 834 031

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प्राक्कथन

कोयला उद्योग के सम्पूर्ण विकास के लिये संगठित अनुसंधान 1975 में सरकार का योजनाबद्ध कार्यक्रम "कोयला विज्ञान एवं प्रौद्योगिकी योजना" के अपनाने के बाद ही प्रारम्भ हुआ। इसने कोयला गवेषण से लेकर खनन के पश्चात पर्यावरणिक विषय तक में व्यापक रूप से अनुसंधान एवं विकास के क्रियाकलापों के 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 के प्रत्येक क्षेत्र से संबंधित उप-समिति द्वारा सहायता प्रदान की जाती है, ये हैं :

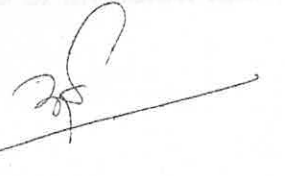
- उत्पादन, उत्पादकता एवं सुरक्षा
- कोयला परिष्करण एवं उपयोग
- पर्यावरण एवं पारिस्थितिकी

1975 लसे कोयला एवं लिग्नाइट उत्पादक कम्पनियों की सक्रिय सहभागिता के साथ कोयला एवं सम्बद्ध उद्योगों से सम्बन्धित राष्ट्रीय अनुसंधान एवं शैक्षणिक संस्थाओं द्वारा कोयला मंत्रालय के विज्ञान एवं प्रौद्योगिकी अनुदान के तहत वर्तमान में अनुसंधान परियोजनाएँ क्रियान्वित की जा रही हैं। इसके परिणामस्वरूप अभी तक 175 करोड़ रुपये की अनुमानित लागत से 277 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 28 चालू परियोजनाएँ एवं 10 पूरी की जा चुकी परियोजनाओं की स्थिति को दर्शाया गया है।

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

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



(ए. के. सिंह)

अध्यक्ष-सह-प्रबंध निदेशक

FOREWORD

Organized research for all round development of the coal industry started only after adoption of Govt's Planned Programme "Coal Science & Technology Plan" in 1975. This has enabled research and development activities over a wide spectrum of subjects ranging from coal exploration to post mining environmental issues.

Central Mine Planning & Design Institute Limited (CMPDIL) is the nodal agency for co-ordinating and monitoring of coal S&T projects.

The Coal S&T Programme is presently administered through an Apex body known as the Standing Scientific Research Committee (SSRC). The SSRC in turn is assisted by a technical sub-committee, which deals with the following major areas of coal research:

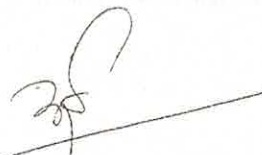
- Production, Productivity & Safety
- Coal Beneficiation and Utilization
- Environment & Ecology

Research projects under S&T Grant of Ministry of Coal are presently being implemented by national research and academic institutions related to coal and allied industries with active participation of coal and lignite producing companies, since 1975. As a result, till date, 277 projects have been completed since inception at an approximate cost of Rs. 175 Crore. Research findings of some projects have made significant impact on the industry in the area of exploration, mining, environment, coal washing and utilization technologies.

This Annual Report describes the status of 28 on-going and 10 completed S&T projects during the year.

It is hoped that this booklet would be useful to all the research personnel, mine planners/designers engaged in coal and allied industries.

Suggestions for improvement of the publication in presentation and content are most welcome to enrich future editions.



(A. K. Singh)

Chairman-Managing Director

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LIST OF ABBREVIATIONS

✓ AMPRI	Advance Materials & Process Research Institute, Bhopal
✓ AMU	Annamalai University, Annamalai Nagar, Chennai
✓ APHMEL	Andhra Pradesh Heavy Machinery & Engineering Limited
✓ AU	Anna University
✓ BCCL	Bharat Coking Coal Limited, Dhanbad
✓ BHU	Banaras Hindu University, Varanasi
✓ CIMFR	Central Institute of Mining and Fuel Research (erstwhile CMRI & CFRI), Dhanbad
✓ CMERI	Central Mechanical Engineering Research Institute, Durgapur
✓ CMPDI	Central Mine Planning & Design Institute, Ranchi
✓ DGMS	Director General of Mines Safety, Dhanbad
✓ ECL	Eastern Coalfields Limited, Sanctoria
✓ ICT	Indian Institute of Chemical Technology, Hyderabad
✓ IISc	Indian Institute of Science, Bangalore
✓ IIT	Indian Institute of Technology, Kharagpur
✓ ISM	Indian School of Mines, Dhanbad
✓ MCL	Mahanadi Coalfields Limited, Sambalpur
✓ NCL	Northern Coalfields Limited, Singrauli
✓ NEC	North Eastern Coalfields, Margerita
✓ NEIST	North East Institute of Science and Technology, Assam
✓ NIRM	National Institute of Rock Mechanics, Kolar
✓ NLC	Neyveli Lignite Corporaation Limited, Neyveli
✓ JU	Jadavpur University, Kolkata
✓ OU	Osmania University, Hyderabad
✓ RDCIS	Research and Development Centre for Iron & Steel, Ranchi
✓ RSMML	Rajasthan State Mines & Minerals Limited, Udaipur
✓ SCCL	Singareni Collieries Company Limited, Kothagudem
✓ SECL	South Eastern Coalfields Limited, Bilaspur
✓ SSRC	Standing Scientific Research Committee
✓ TNAU	Tamil Nadu Agricultural University, Coimbatore
✓ WCL	Western Coalfields Limited, Nagpur
✓ VCRC	Vector Central Research Centre, Pondichery

Production, Productivity & Safety

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2008-09

1. Name of the Project	:	Indigenous development of prototype longwall support (chock- shield)
2. Date of Start	:	Aug 2004
3. Scheduled date of completion	:	July 2005
4. Revised date of completionn	:	Aug 2009/Nov 2008/Nov 2007/Dec 2006/Dec 2005
5. Implementing Agency	:	Singareni Collieries Company Ltd.
6. Project Leader/co-ordinator	:	Director (Operation), SCCL and MD. APHMEL, Kondapalli
7. Total Approved Cost	:	Rs. 228.47 Lakh S&T Grant- 197.97 Lakh Contribution SCCL - Rs. 30 .50 Lakh.

DESCRIPTION OF THE PROJECT

8. Objective

To make longwall method of coal mining economically viable by :

- Developing and manufacturing indigenous chock shields of adequate capacity and compatible with Indian geo-mining conditions.
- To bring down the cost component of powered supports to about 50% of the imported cost.

9. Status as on 31.03.2009 :

As per the advice of the Watch Dog Committee, the fabrication of New Rear Shield is completed by taking help in welding procedures from BHEL, Hyderabad and transported to ITF, Jessops and testing started with new Rear Shield, During Torsional test, a minor weld crack developed in the welding after completion of 1000 cycles.

The matter has been taken up with DGMS. DGMS has given clearance to rectify the defects in welding and complete the remaining cycles.

The Rear Shields - 2 Nos. brought to APHMEL from M/s Jessops for repairs. The Repairs have been completed on the 2 Nos. Rear shields and are ready to transport to M/s Jessops for remaining cycles of test.

10. Slippage, if any :

- The first chock shield was subjected to test by M/s Jessops, Kolkata, during testing lateral load test at 104% load '2' cracks were developed in the weld joint of the base plate. The watchdog committee and DGMS advised to fabricate a new support for offering the complete cycle testing.
- Accordingly, the high tensile steel plates materials are sourced from abroad and hence it took long time to procure the materials.
- The electrodes required for fabrication are of special type which are not regularly produced. The identification of suitable electrodes by attempting several welding procedure specifications took more time. The electrodes required are made as per order and hence supply of electrodes also took long time.
- M/s. ITF Jessop, Kolkata is the only firm available in India having testing facility and they should be free to undertake type testing of powered roof support and it takes 6 months time to complete the life cycle testing.

The second chock shield was sent M/s Jessops for life cycle testing in the month of May, 2007. After completion of 96% of life cycle testing, during Torsional test in the month of October, 2007, '3' weld cracks were developed in welding portion of the Rear Shield. As per Watchdog Committee advice, the fabrication of New Rear Shield is completed by taking help in welding procedures from BHEL, Hyderabad and transported to ITF, Jessops and testing started with new Rear Shield. During Torsional test, a minor weld crack developed in the welding after completion of 1000 cycles.

The matter has been taken up with DGMS. DGMS has given clearance to rectify the defects in welding and complete the remaining cycles.

The Rear Shields - 2 Nos. brought to APHMEL from M/s Jessops for repairs. The Repairs have been completed on the 2 Nos. Rear shields and are ready to transport to M/s Jessops for remaining cycles of test.

11. Action plan for 2009-10 :

Sl. No.	Activity	Date of start	Date of completion
1.	The Rear Shields-2 Nos. repair for minor weld crack at APHMEL	Jan 2009	Jan 2009 end
2.	Remaining life cycle testing	Feb 2009	Feb 2009 end
3.	DGMS Approval	Mar 2009	15 Mar 2009
4.	Report preparation and submission to CMPDIL	16 Mar 2009	April 2009 end

1. Name of the Project	:	Stabiity of parting between coal pillar workings in level contiguous seams during depillaring.
2. Date of Start	:	Oct 2004
3. Scheduled date of completion	:	Oct 2007
4. Revised date of Completion	:	Dec 2009/Sep 2008
5. Implementing Agency	:	CIMFR, Dhanbad
6. Sub Implementing Agency	:	CIMFR
7. Project Leader	:	Dr. Rajendra Singh, Scientist, CIMFR, Shanbad
Project Co-ordinator	:	Dr. S.K. Singh, Scientist F, CIMFR
8. Total Approved Cost	:	Rs. 50.54 Lakh

DESCRIPTION OF THE PROJECT

9. Objective

- To develop guidelines for assessing parting stability taking the following factors into consideration.
 - (a) in situ stresses
 - (b) roadway width
 - (c) depth of cover
 - (d) parting thickness
 - (e) eccentricity and
 - (f) RMR
- The guidelines so developed as per first objective would be validated at four selected sites of depillaring. At all the sites, in-situ stresses, magnitudes and directions will be essentially measured.
- To do numerical modelling with an aim to derive a rational formulation for parting stability for depillaring situations.

10. Status as on 31.03.2009

Measurement of in-situ stresses at Shyamsunderpur Colliery, ECL was completed. Measurement of in-situ stresses in RG-II Area, SCCL was also completed. The geotechnical instruments as proposed and approved are partly purchased and partly to be purchased soon. Immediately after receiving of the geotechnical instruments, strata monitoring will be taken up at Shyamsunderpur Colliery, ECL. A High-level discussion with DGMS and mine management will be shortly convened to finalise the modalities of trial panel to be run and intricacies related to necessary approval from DGMS.

11. Slippage, if any :

The project got delay due to delay in procurement of Geo-technical instruments.

12. Action Plan for 2009-10 :

Sl. No.	Activity	Date of start	Date of completion
1.	Procurement of geo-technical instruments	Continuing	July 2009
2.	Development of guidelines based on numerical modelling	Continuing	Oct 2009
3.	Validation of guidelines at study site with instrumentation at ECL	Immediately after purchase of the instruments Aug 2009	Nov 2009

1. **Name of the Project** : **Development of a micro seismic monitoring system for stability analysis of underground mine workings under "Difficult to cave" roof conditions**
2. **Date of Start** : Oct 2004
3. **Scheduled date of completion** : Mar 2006
4. **Revised date of completion** : Sep 2009/Sep 2008/Sep 2007/March 2007
5. **Implementing Agency** : CIMFR, Dhanbad
6. **Sub-implementing** : ECL, Sanctoria, WB.
7. **Project Leader** : Sri G. Banerjee, Scientist, CIMFR
8. **Total Approved Cost** : Rs. 47.849 Lakh

DESCRIPTION OF THE PROJECT

9. Objective

- To develop a scientific method for assessing stability of mining areas being worked under "Difficult to cave roof condition".
- To assess the efficacy of stabilization in the areas where mining was done long back.

10. Status as on 31.03.2009 :

- Source location of the event
- Event magnitude which is the relative measure of strength of the seismic event.
- Energy released by seismic event.
- Seismic Moment of the event for the measurement of the co-seismic inelastic deformation at the source.
- Corner frequency of the event at which most energy is radiated from spectral analysis of the event in the frequency domain.
- Event source size : Source radius, Source area i.e. the area of the co-seismic inelastic deformation of a planer source and apparent source volume of rock with the co-seismic inelastic strain.
- Magnitude of Stress Drop, $\Delta\sigma$, and strain drop $\Delta\varepsilon$ due to the event.
- Magnitude of the **Seismic strain**, ε_s , and **Seismic stress**, σ_s , due to cumulative co-seismic deformations within the volume ΔV over a period Δt .
- Energy Index, a parameter for assessing the stability of the mining areas.

Testing of the above said software from the virtual data has been done and the validity of the software has been confirmed from experimental observations.

The indigenously developed software will help us to develop norms and guidelines suitable for Indian geo-mining conditions for quantifying the degree of instability over worked out mining areas from the calculated seismic parameters.

Field Experimentation

- Lithology of overlying strata at AE-2 longwall panel of Jhanjra Project and S-2 and S-3 panels and old BG workings of Chora Mine have been collected.
- Physico-mechanical properties of overlying roof rocks, caving behaviour and surface subsidence observation and other ground control related observations have been compiled after visiting the site of Jhanjra and Chora mine.
- Microseismic study for the assessment of the stability over AE-2 longwall panel of Jhanjra mine, ECL has been conducted from 15th January, 2009 to 18th February, 2009. Compilation and analysis of data generated over this panel is in progress.
- At present the system has been installed over Chora 10 Pit Mine of Kenda Area since 18th March, 2009 and online continuous recording of microseismic events is in progress.
- Experimentation at site-1 over S-2 and S-3 panels of Chora 10 pit mine is already completed. Compilation and analysis of data is in progress.
- Experimentation at site-2 over old BG workings of the same mine is presently in progress.
- The system will be shifted to Parascole Colliery in the month of May, 2009.

11. Reason for slippage :

Delay in procurement of the equipment/instruments.

12. Action plan for 2009-10 :

Project has been extended up to 30th September, 2009. Field trial has been planned up to June, 2009. Analysis and final report preparation will be completed by September, 2009. Detailed action plan for 2009-10 is given below :

Sl. No.	Activity	Date of start	Date of completion
1.	Field trial, monitoring and analysis of data at site 'A' i.e. at site-2 of Chora 10 pit mine, Kenda Area, ECL	Apr 2009	10 May 2009
2.	Field trial, monitoring and analysis of data at site 'B' i.e. to Parascole Colliery, Kajora Area, ECL	11 May 2009	June 2009
3.	Compilation & analysis of all data	Apr 2009	Aug 2009
4.	Final report preparation	Sep 2009	Sep 2009

1. **Name of the Project** : **Characterization of rock and explosive parameter for optimal explosive energy utilization in opencast blasting.**
2. **Date of Start** : Apr 2005
3. **Scheduled date of completion** : Mar 2008
4. **Revised date or completion** : March 2010
5. **Implementing Agency** : Central Mine Planning & Design Institute Limited, Ranchi
6. **Sub-implementing** : CIMFR, Dhanbad
7. **a. Project Leader** : Mr. D. Basu, Dy. CME, Blasting Cell, CMPDI, Ranchi
Dr. P. K. Singh, Scientist, CMRI, Dhanbad
Mr. M. P. Roy, Scientist, CMRI, Dhanbad
- b. Project Co-ordinator** : Mr. S. C. Kar, Dy. CME, Blasting Cell, CMPDI, Ranchi
Dr. A. Sinha, Acting Director, CIMFR, Dhanbad
Dr. P. Pal Roy, Scientist, CIMFR, Dhanbad
8. **Total Approved Cost** : Rs. 270.37 Lakh
for CMPDI – Rs. 206.15 lakh
for CIMFR – Rs. 64.22 lakh

DESCRIPTION OF THE PROJECT

9. Objective

- Effect of detonator timings and delay sequences on blast vibration. Confirmation by measurement of near and far field vibrations for production blasts with well characterised explosive products.
- Effect of initiation mode on the release of explosive energy. Measurement of energy release partitioning and efficiency for confined and unconfined charges by means of under water test.
- Energy release characteristics of explosives and their effect on blast results.
- Effect of sympathetic pressure on energy release and VOD in the receptor explosives.
- To establish the relationship between rock geo-technical properties and the explosive properties.

10. Status as on 31.03.2009 :

Extensive field trials were carried out at Umrer Project, WCL, Sonepur Bazari Project, ECL and Kusumunda Project, SECL for explosive characterisation. Rock samples from Umrer Project, WCL,

Sonepur Bazari Project, ECL and Kusumunda Project, SECL were sent to University of Toronto, Canada for determining dynamic tensile strength and fracture toughness. MASW test were carried out at Umrer Project, WCL for rock mass characteristic. Data analysis is in progress to establish the relationship between geotechnical properties and the explosive properties.

11. Slippage, if any :

NIL

12. Action Plan for 2009-10

Sl. No.	Activity	Date of start	Date of completion
1.	Field investigation, collection of data and experimentation	Apr 2009	Sep 2009
2.	Compilation of data and their analyses	Apr 2009	Sep 2009
3.	Report preparation	Oct 2009	Mar 2010

1. **Name of the Project** : **Establishment of standard method for assessment of incendivity characteristics of 32mm diameter permitted explosives.**
2. **Date of Start** : **May 2005**
3. **Scheduled date of completion** : **Apr 2008**
4. **Revised date of completion** : **Sep 2009**
4. **Implementing Agency** : **CIMFR, Dhanbad**
5. **Project Leader/Project Co-ordinator** : **Sri S. K. Roy, Scientist, CIMFR**
Sri R. R. Singh, Scientist, CIMFR
6. **Total Approved Cost** : **Rs. 41.19 Lakh**

DESCRIPTION OF THE PROJECT

7. Objective

Establishment of standard method for assessment of incendivity characteristics of 32mm diameter permitted explosives equivalent to the present method followed for 37mm diameter cartridges of permitted explosives.

8. Status as on 31.03.2009 :

- Trials were conducted for the incendivity characteristics of Permadyne and Pentadyne of M/s Gulf Oil Corporation Limited, Hyderabad and Indocoal-1, Indocoal-3 and Indocoal-5 of M/s IBP Co. Ltd., Korba, Powergel P-101 & Powergel P-501 of M/s Indian Explosives Limited, Gomia, Supercoal-1 and Supercoal-5 of M/s Solar Explosives Limited, Nagpur with varying charge weight using 32mm and 37mm dia cartridges in existing Cannon of 55mm dia bore. In the existing Cannon of 55mm dia bore, incendivity characteristics of Powergel P-501 were studied with 25mm and 50mm diameter cartridges and Supercoal-1 with 45mm diameter cartridges.
- As no trials in the Cannon with 40mm dia bore under similar conditions could be done because of delay in purchase of the Cannon/inner most member of the Cannon with 40mm bore, no comparative results could be generated.
- The trials so far conducted in the existing set up revealed that there is no significant difference in the incendivity behaviour of explosive samples studied in 32mm and 37mm diameter cartridges in 55mm dia bore cannon. This finding need to be corroborated or modified after further studies with 32mm dia cartridges in 40mm bore cannon.

9. Slippage, if any :

Project activities have got delayed by about 30 months due to delay in purchase of cannon or innermost member (liner) of the cannon because of following reasons :

- (i) Delay in purchase of Cannon of special design proposed under this project because there was no response from any party in Global tender published twice.
- (ii) With change in specification agreed by SSRC sub-committee on 16.09.2006, purchase orders were issued to supply 40mm diameter bore innermost member (liner) to M/s Shakticast Pvt. Ltd., Dhanbad and 55mm diameter bore innermost member (liner) to M/s HEC, Ranchi.
- (iii) 40mm diameter bore innermost member (liner) supplied by M/s Shaticast Pvt. Ltd., Dhanbad was fitted into our existing cannon. But, the new liner was not found satisfactory during the trial tests. M/s Shaticast Pvt. Ltd., Dhanbad agreed to replace the damaged liner with a new liner.
- (iv) M/s Shakticast Pvt. Ltd., Dhanbad replaced the damaged liner with a new liner and it was fitted into one of our existing cannon in January, 2009. But, this liner also did not perform satisfactorily and got damaged and thus trials had to be stopped.
- (v) M/s Heavy Engineering Corporation, Ranchi supplied the liner with 55mm dia bore on 12.02.2009 and it has been given for fitting into one of our existing cannon which is expected to be delivered in June, 2009.

If this liner with 55mm bore supplied by M/s HEC works satisfactorily, we may place order for supply of 40mm bore cannon to them and then only envisaged work of incendivity studies with 32mm diameter cartridges in 40mm bore cannon can be done. Thus, the project can not be completed even within the revised completion date of 30.09.2009. Depending on the satisfactory performance of newly supplied liner by M/s HEC, Ranchi future action shall be planned accordingly.

10. Action Plan for 2009 - 10

Sl. No.	Activity	Date of start	Date of completion
1.	Purchase of equipments	May 2009	Sep 2009
2.	Determination of W_{50} value of 37mm diameter explosives supplied by different manufacture in 55mm bore cannon	Sep 2009	Sep 2009 end

1. **Name of the Project** : **Underground coal Gasification and its utilization for power generation studies in lignite deposits of Rajasthan.**
2. **Date of Start** : Sep 2005
3. **Scheduled date of completion** : Aug 2009
4. **Implementing Agency** : Neyveli Lignite Corporation Limited
Neyveli - 607 807, Tamilnadu
5. **Project Leader/Project Co-ordinator** : Sri K. S. Anandan
Director (Mines), NLC Ltd.
Sri S. N. Sahay
DGM (Geology), NLC Ltd.
6. **Total Approved Cost** : Rs. 1125 Lakh
MoC Part – Rs. 562.50 lakh
DST Part – Rs. 375.00 lakh
Contribution of NLC – Rs. 187.50 lakh

DESCRIPTION OF THE PROJECT

7. Objective

- To study and evaluate the exploration data of certain lignite block and selection of a suitable lignite block of UCG studies.
- To undertake detailed exploration in selected lignite block and assess the deposit characteristics, quality and reserves and carryout specialized studies on lignite.
- To establish and carryout UCG pilot studies and evaluate the heat values and other characteristics of producer gas.

8. Status as on 31.03.2009 :

- All the available exploration reports of select lignite reports are segregated and kept ready for review & pre-selection study by the consultants. Exploration reports of DMGR, Govt. of Rajasthan has also been procured.
- As a first step, NLC floated global tender on 30.9.2005 for appointment of Consultant. But no one responded to the tender, even though tender submission date was extended 3 times with the last extension upto 29.4.06 (more than 6 months time).
- Hence, during various international Seminars/Conferences, the matter was discussed with certain foreign agencies who have got expertise in the field. Some of the firms showed interest to provide consultancy to UCG Projects, however they are reluctant due to NLC's general terms & conditions given in the tender document.
- The matter of difficulty in appointing the consultant through global tender was brought to the notice of the sub-committee on Production, Productivity & Safety of the standing Scientific Research Committee (SSRC) in its meeting held at Ranchi on 16.09.2006 requesting them to grant permission to appoint the consultant on nomination basis after getting the commercial offer from a prospective firm. The SSRC sub-committee indicated NLC to follow the prevailing practice to NLC in appointing the consultant.

- LTE was issued for appointment of consultant by issuing the tender to 1. M/s IMC Geophysics International Ltd., 2. ONGC in association with SIM, Russia, 3. CSIRO, Australia, 4. Dr. Alexander A. Kuzetnov, Centre UCG, Russia with some relaxed tender conditions such as withdrawal of Bank Guarantee (BG), Contract Performance Guarantee (CPG) & Liquidated Damage (LD) clauses. Only one valid bid was received from M/s CSIRO, Australia and they had quoted a total of Rs.1957.20 lakhs against the approved provision of Rs. 150 lakhs towards the consultancy cost. Hence, NLC submitted a cost revision proposal to SSRC during December, 2007 to enhance the project consultancy cost. The sub-committee directed NLC to first get the proposal approved by its Board and then to put up to the sub-committee.
- NLC's Board approved the proposal to enhance the total project cost from Rs.1125 lakhs to Rs. 2932.146 lakhs in view of the increase in the project consultancy fees.
- After Board approval, NLC submitted the proposal to CMPDI and the issue was discussed in the Sub-Committee meeting held during July 2008 and the committee advised NLC to recast the total project cost since cost escalation is possible under other heads also and decided to put up the views to the main SSRC.
- Subsequently, the issue was discussed in the 43rd SSRC meeting held during October 2008 and the SSRC observed that the project got delayed by three years with almost no progress. Therefore, the committee was of the opinion to expedite the project and additional funding required for the project should be given by NLC.
- For recasting the project, NLC had written to M/s Carbon Energy, Australia, European Commission and M/s Gazprom Promgaz, Russia requesting to furnish the total project cost details.
- As desired by M/s Gazprom Promgaz, Russia, the block details of Raneri, Gadiyala and Girajsar were furnished to them. After scrutiny of data provided by NLC, M/s Gazprom Promgaz, Russia, during a presentation to NLC, informed that the Raneri block is found to be suitable for UCG technology. Now, NLC has requested them to work out the total project cost.
- Based on the guideline by the Russian expert, other preliminary works would be taken up.

9. Slippage, if any :

UCG is a new technology for which technical know-how not available within country, but is available only in limited foreign countries. The project envisages appointment of a consultant to the project under whose guidance and advice, the project would be implemented. Other project activities could be initiated only after appointment of consultant and completion of pre-selection study & identification of a suitable lignite block by the consultant.

Due to delay in appointment of consultant to the project, other immediate activities could not be taken up as scheduled; as such subsequent activities are also getting delayed.

10. Action Plan for 2009 - 10 :

Sl. No.	Activity	Date of start	Date of completion
1.	Preliminary exploration	Oct 2009	Mar 2010
2.	Sample testing and special characterization studies	Nov 2009	Mar 2010
3.	Base line environmental data collection	Mar 2010	Aug 2010

1. **Name of the Project** : **Investigation of Cavability of Overlying Strata and Development of Guidelines for Estimation of Support Capacity for Longwall Faces.**
2. **Date of Start** : Nov 2005
3. **Scheduled date of completion** : Oct 2008
4. **Revised date of completion** : Mar 2010
5. **Implementing Agency** : NIRM, CIMFR, ISM, Dhanbad & CMPDI.
6. **Sub-implementing Agency** : SECL, Bilaspur; SCCL, Kothagudem; ECL, Sanctoria, W.B.; BCCL, Koyala Bhawan, Dhanbad and CMPDIL, Ranchi.
7. **Project Leader** : Dr. V. Venkateswaran, Scientist, NIRM
Prof. U. K. Singh, Deptt. of Mining Engg., ISM, Dhanbad
Mr. G. Banerjee, CIMFR, Dhanbad
8. **Project Co-ordinator** : Mr. A. K. Ghosh, CIMFR, Dhanbad
Prof. S. N. Mukherjee, ISM, Dhanbad
9. **Total Approved Cost** : Rs. 461.3674 Lakh
CIMFR – Rs. 200.142 lakh
NIRM – Rs. 187.910 lakh
ISM – Rs. 63.3154 lakh
CMPDI – Rs. 10.00 lakh

DESCRIPTION OF THE PROJECT

10. Objective

"Development of an integrated approach for selection of the capacity of powered support and formulation of a strata and support behaviour monitoring scheme for longwall operation in Indian coal mines."

The work aims in analysing a few previously worked out and presently running longwall panels and studying the sequence and nature of caving of overlying rocks by numerical modelling techniques. The steps to achieve the above objectives are as follows :

- Develop a suitable method for the assessment of cavability of overlying roof rocks.
- Categorize the coal measure rock, rock beds based on its caving behaviour.
- Develop guidelines for estimation of support capacity for longwall faces and gate roads.
- Evolve a safety factor for estimation of support capacity.
- Suggest guidelines and requirement of hard roof management techniques for difficult to cave roof conditions.
- Standardization of support condition monitoring techniques to be implemented for the longwall faces and gate roads.
- Standardization for monitoring techniques of strata in and around longwall faces and support behaviour at caving longwall faces and its instrumentation.

11. Status as on 31.03.2009 :

(i) Literature Survey

Extensive literature survey has been done on assessment of cavability of overlying rocks and roof rock classification approaches of the various researchers worldwide.

(ii) Development of an index or parameter for the assessment of cavability of the overlying roof rocks

From plate theory (Timoshenko, 1947) and the mathematical model of Obert and Duvall (1967) using the beam and plate theory, a method has been developed for estimation of the equivalent main fall span and this has been compared with the observed main fall span at some of the previously worked out panels. The equivalent main fall span overlying a longwall panel is the main fall span for the main roof with a long face length.

The equivalent main fall span may be used as an index or parameter for the assessment of cavability of the overlying roof rocks.

(iii) Development of an algorithm for identification of caving strata overlying coal seam

Geo-technical and geo-mining parameters of some of the previously worked out panels in VK 7, GDK 9, GDK 10A and PVK-5 Incline mine of SCCL and Jhanjra mine of ECL have been collected and a large number of lith logs of the boreholes at the above mines were collected and studied in details.

Based on the study of the various boreholes over the panels worked out at these mines, an algorithm has been developed to identify the nature and type of the caving strata overlying coal seams.

(iv) Categorization of the coal measure rock, rock beds based on its caving behaviour

Based on the data collected from previous working panels, the parameters have been identified to distinguish the immediate roof, main roof and upper main roof of the overlying strata. The thickness of the immediate roof, main roof and the upper main roof alongwith the equivalent main fall span are the parameters which will be used for categorizing the coal measure rocks.

(v) Development of a numerical model for simulation of the caving of rock beds

A numerical model for simulation of the caving of rock beds with the advance of the longwall face has been developed. This model can be used for predicting the main fall, periodic falls and the variation of the support load, abutment stress, convergence and convergence slope with the advance of the longwall face.

12. Slippage, if any :

Slippage of 24 months due to delay in procurement of geotechnical instruments.

13. Action Plan for 2009 - 10

Sl. No.	Activity	Date of start	Date of completion
1.	Procurement of Instruments	Apr 2009	Oct 2009
2.	Analysis of previous Longwall panels with existing support	Apr 2009	Oct 2009
3.	Simulation of caving behaviour by numerical modeling	May 2009	Dec 2009
4.	Field Investigation & modeling (Site A)	Sep 2009	Mar 2010

1. **Name of the Project** : **Delineation of barrier thickness against water logged working in underground Coal Mines.**
2. **Date of Start** : **May 2007**
3. **Scheduled date of completion** : **Apr 2009**
4. **Implementing Agency** : **CIMFR, Dhanbad**
5. **Project Leader/Co-ordinator** : **Dr. K.K.K. Singh, Scientist CIMFR, Dhanbad**
Dr. A. Sinha, Director, CIMFR, Dhanbad
6. **Total Approved Cost** : **Rs. 342.2692 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives :

- (i) Establishment of GPR signatures for different geological formations, cavities and waterlogged workings.
- (ii) Delineation of galleries and pillar from the surface and form underground with the help of GPR survey.
- (iii) Delineation of barrier thickness of 60 m from the approachable location to unapproachable workings and extend the same study for unknown working in underground coal mines.
- (iv) Verification of GPR survey results with the help of integrated geophysical survey like multi electrodes resistivity imaging survey along with some bore hole data.

8. Status as on 31.03.2009 :

- Out of three responding bidders, only one firm M/s Radarteam AB, Sweden submitted their technical offer only. Due to single quotation and after request of our Purchase Committee, for valuable suggestion for proceeding further in this connection. After getting reply from CMPDIL, a letter was placed before CIMFR Purchase Committee for further necessary action. In view of some technical and administrative problems, CIMFR Purchase Committee decided to float tender again for the third & last time (The Times of India dated 28.05.2008). Two bids i.e. from M/s Radarteam AB, Sweden and M/s International Groundradar Consulting Inc., Canada had been received. The meeting of the technical committee was scheduled on 03.10.2008 for examination of the technical bids. After detailed discussions and examination of the bids on 03.10.2008 & 11.11.2008, both the bids had been declared technically qualified by the technical committee on 11.11.2008 and they recommended to open the price bids. Both the bids (from M/s Radarteam AB, Sweden and M/s International Groundradar Consulting Inc., Canada) had been declared technically qualified on 02.12.2008 by CIMFR Purchase Committee and, after that, the commercial bids of the two firms have been opened on 10th February, 2009. The quotation of M/s International Groundradar Consulting Inc. has been found L₁ (Lower quotation) and declared qualified commercially by the CIMFR Purchase Committee. Now, signing of MOU with the techno-commercial qualified bid (M/s International Groundradar Consulting Inc., Canada) is under process.

- Visited some mines of ECL and BCCL for location of known 60m coal barrier thickness in underground coalmines under different conditions like fully waterlogged/partially waterlogged for experimental study.

9. Slippage, if any :

Approximately one year & nine months has been lapsed in two times floating of Expression of Interest (EOI) and one time floating of global tendering with two times time extension for the development of GPR system. Initially, the approved date for floating of global tender and selection of suitable firm for development of specified GPR System was January 2008. Therefore, time extension for one and half years for successful execution of the project has been proposed and already sent to CMPDIL, Ranchi.

10. Action Plan for 2009 - 10

Sl. No.	Activity	Date of start	Date of completion
1.	Floating of Global Tender and selection of suitable firm for development of specified GPR system	In the process	Apr 2009
2.	Development of GPR System, Field investigation, Collection of data and experimentation with developed GPR	May 2009	Apr 2010
3.	Compilation of data and their analyses and report preparation	Nov 2009	Oct 2010

1. **Name of the Project** : **Model studies on gravity blind back filling method and evaluation of a pre jamming indication parameters in the field.**
2. **Date of Start** : **March 2008**
3. **Scheduled date of completion** : **Feb 2011**
4. **Implementing Agency** : **IIT, Kharagpur**
5. **Project Leader/Co-ordinator** : **Dr. Samir Kr. Pal, Deptt of Mining Engineering, IIT Khagpur**
6. **Total Approved Cost** : **Rs. 395.18 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives :

- Validating the findings on the laboratory model by carrying out field trials on simple hydraulic back filling method by gravity and measuring its efficiency in terms of large area coverage from a single boreholes at shortest possible time.
- To validate the empirical relationship on the estimation of the slope and size of the filled out area in terms of relative spreads in strike and rise direction as obtained from the experimental model study at IIT, Kharagpur.
- Study the variation of inlet pressure based of the slurry with with time during the progress of filling work and to validate the effectiveness of the proposed "Pre-Jamming Indicator" to mark the arrival of final phase of filling. If necessary, suitable modification of this "Pre-Jamming Indicator" will also be done for field applicability.

8. Status as on 31.03.2009 :

- (i) Suitable location for field trial of gravity blind back-filling techniques has been identified and permission to carry out project activities obtained. A suitable location for the feeder boreholes and the other boreholes to be used for the camera insertion are marked on the plan.
- (ii) Order has been placed for a fully equipped mixing chamber.
- (iii) Order has been placed for variable speed sand conveyor.
- (iv) The procurement process for remote operated underwater video camera and its devices has been initiated.
- (v) Permission for drawing electrical power lines from Durgapur Power Supply Corporation Ltd. for pump room and mixing chamber, installation of related accessories has been applied for.
- (vi) Six numbers of boreholes for air outlet has been drilled and connected to the underground mine working.
- (vii) Fabrication of the moving laboratory is in progress and expected to be completed shortly.
- (viii) Fabrication of the sand conveyor is nearing completion.

- (ix) Purchase orders for the flow meters, water level monitoring devices and the data acquisition system devices has been issued.
- (x) The specifications of the submersible remotely operable robotic vehicle cameras (ROVs) and also of the pumps are finalized and the order will soon be placed with the respective suppliers.
- (xi) One 100 KVA field transformer has been procured and installed at the work site at Chadola.
- (xii) The construction of an office room and a store for the temporary use at the work site is completed.

9. Slippage, if any :

Nil

10. Action Plan for 2009 - 10

These following main activities will be carried out during 2009-10

Sl. No.	Activity	Date of start	Date of completion
1.	Design and fabrication of the self powered fully equipped mining chamber.	Mar 2008	Jun 2009
2.	Obtaining quotation and procurement of equipment.	Mar 2008	Jun 2009
3.	Installation, calibration and test run of pumps and all other measuring devices.	Oct 2008	Sep 2009
4.	Procurement and installation of data acquisition system.	Jul 2008	Sep 2009
5.	Field experimentation on gravity blind back filling methods from 1st borehole.	Oct 2009	Mar 2010

1. **Name of the Project** : **Heigh resolution seismic monitoring for early delectation and slope failures in opencast mines.**
2. **Date of Start** : **March 2008**
3. **Scheduled date of completion** : **Feb 2011**
4. **Implementing Agency** : **Anna University, Chennai**
5. **Sub-Implementing Agency** : **Singareni Collieries Company Ltd. (SECL)**
6. **Project Leader/Co-ordinator** : **Dr. L. Ajay Kumar, Deptt of Mining Engineering, Collage of Engineering, Anna Uni Channai.**
7. **Total Approved Cost** : **Rs. 124.30 Lakh**
S&T Grant : Rs. 99.44 Lakh
Contribution SCCL : Rs. 24.86 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives :

The objectives of this study are :

- Advanced detection and analysis of slope failures of dumps and pit benehes
- Continuous micro-seismic monitoring of pit slopes.
- Scope stability studies in high wall mining
- Suggesting control mourners for stope failure and high walls.

8. Status as on 31.03.2009 :

- Detailed discussions held with the official of Singareni Coallieries Company Ltd., the sub-implementing agency. Managuru OCP-II mine of SCCL is proposed for the study.

9. Slippage, if any :

Nil

10. Action Plan for 2009 - 10

These following main activities will be carried out during 2009-10

- (i) Literature study.
- (ii) Recruitment of research associates and purchase of equipment.
- (iii) Identification of Mine and selection of site for the sensors.
- (iv) Drilling & placement of trial sensors.

1. **Name of the Project** : **Coalbed Methane (CBM) Recovery & Commercial Utilisation**
2. **Date of Start** : Oct 1999
3. **Scheduled date of completion** : Sep 2004
4. **Revised date of completion** : Dec 2009/Dec 2007/Oct 2006/Feb 2006
5. i. **Implementing Agency** : Central Mine Planning & Design Institute Ltd.
- ii. **Sub-implementing** : Bharat Coking Coal Ltd.
6. **Project Leader/Co-ordinator** : Chief Project Manager (CBM Cell), CMPDI
7. **Total Approved Cost** : Rs.9242.70 Lakh
- Funding Agencies** : (a) Global Environment Facility (GEF), USA
(b) United National Development Programme (UNDP)
(c) Govt. of India (GoI-S&T)
(d) ONGC
- Contribution:**
- S&T Grant – Rs.1805.80 Lakh
GOI (kind) – Rs.699.40 Lakh
UNDP/India – Rs.545.10 Lakh
UNDP/GEF – Rs.4143.70 Lakh
ONGC Co-sharing – Rs.1215.70 Lakh
Part of the Revenue – Rs.833.00 Lakh
Cost met out of the income generated from the Project

DESCRIPTION OF THE PROJECT

8. Objective

- (i) Strengthen and increase capacity of CMPDIL, BCCL, ISM, CMRI, Ministry of Coal, CIL and the Ministry of Environment to develop and Support mine associated CBM recovery and use, and experience in the identification, design, and implementation of programmes to recover and use coalbed methane in a safe, cost effective, and environmentally acceptable manner.
- (ii) Prepare and execute demonstration Projects at the Moonidih and Sudamdih coal mines located in the Jharia Coalfields for the recovery and use of mine associated CBM in the Jharia Coalfields. Design and execute CBM resource recovery programmes using three different drilling technologies at two proposed demonstration sites.
- (iii) Use gas recovered from successful execution of the above objectives for vehicle refueling and electric power generation.
- (iv) Develop and adopt action plan for replication of successful aspects of demonstration projects. Use the CBM Clearing house to disseminate information, educate, promote, and facilitate interaction with potential foreign investors.

9. Status as on 31.03.2009 :

- (i) Drilling of 2 bore holes completed.
- (ii) Gas -Gen set is under installation.
- (iii) Pipe line lying on surface completed
- (iv) Pipe line lying in underground is in progress
- (v) Steering vehicle is yet to be procured.

10. Slippage, if any :

There has been delay in procurement of various equipment packages due to repeated retendering by UNIDO, which has resulted in project time over run.

11. Action Plan for 2009 – 10

- (i) Procurement of remaining equipment
- (ii) Drilling will continue at different identified sites.
- (iii) Lying of pipe line in underground.
- (iv) Recovery of gas and its utilization.

1. **Name of the Project** : Hydrogeological studies for control or ground water for safe and economic mining of Lignite Deposits in Nagpur district of Rajasthan.
2. **Date of Start** : May 2007
3. **Scheduled date of completion** : Apr 2008
4. **Revised date of completion** : March 2009
5. **Implementing Agency** : Rajasthan State Mines and Minerals Ltd. (RSMML), Udaipur
6. **Project Leader/Co-ordinator** : Shri L.S. Rathore, Group General Manager (Lignite)
7. **Total Approved Cost** : Rs.182. 12 Lakh
S&T Grant - Rs. 145.696 Lakh
Cont. RSMML - Rs. 36.424 Lakh

DESCRIPTION OF THE PROJECT

8. Objective

- Detailed evaluation of ground water potential of water bearing horizons associated with lignite deposits. Method and extent of ground water control operations for safe and economic mining of lignite deposits.
- Estimation of static and dynamic ground water reserves and yield potential for 25 years.
- Effect of pumping on water quality in long run and probable change in underground water balance.
- Assessing the full economic impact of ground water management for mining lignite resource in the area.
- Environmental impact assessment of lignite mining arising out of ground water control operations.

9. Status as on 31.03.2009 :

(i) Sanction of grant from S&T Fund of Ministry of Coal

Sanction of Rs.182.12 lacs has been made by Ministry of Coal, out of its S&T fund for meeting expenses under this study vide their order No. 34012/2/2007-CRC dated 26.03.2007. 20% of the amount will be spent by RSMML. The amount of the grant has been released on September, 2007.

(ii) Slim Hole construction of 400 mtrs. depth (with casing upto 265 mts)

This has been undertaken through Rajasthan Ground Water Deptt. This slim hole was geo-physically

logged by CGWB. Data related to lithology, quality of water and minealogical examination has been provided to CGWB.

- (iii) All types of technical data required for this study have been collected and furnished to CGWB and NIH, Roorkee. The NIH will be carrying out mathematical modelling work for this study and will also prepare report on behalf of RSMML.

The work of construction of exploratory wells for conducting pumps tests could not be commenced, as planned due to the non availability of 12" size casing pipes with Rajasthan Ground Water Department. In order to over come this situation, RSMML decided to purchase the 12" size casing pipes itself and get the construction of exploratory wells and observation wells through Ground Water Department, Rajasthan. The pipes have been purchased under DGS&D rate contract and first lot, comprising of 10 metric tonne pipes (180 mtrs) as been received at our mines site. The construction of exploratory wells 2 observation wells and one piezometer has been completed. The pump test is to be carried out on this set very shortly. The CWGB Hydrogeologists from their Regional Office at Jaipur and the unit office at Jodhpur are regularly visiting the site for carrying out supervision of tube well construction and for providing advice regarding the study. The details of tubewells constructed by RGWD are given below :

Tubewell ID	Type of Tubewells	Drilling meterage	Casing meterage
REW-1	Exploratory Well	254.00	141.00
REW-2	— do —	254.00	120.00
ROW-1	Observation Well	200.00	141.00
ROW-2	— do —	111.00	106.40
RPZ-1	Piezometer	130.00	95.70
		949.00	604.10

- (iv) The National Institute of Hydrology, Roorkee have been associated in the project for undertaking mathematical modeling on behalf of RSMML and for carrying out studies on environmental isotopes to study ground water recharge and movement. An interim report has been submitted by them which has been provided to CGWB and CMPDI.

10. Slippage, if any :

Work on this project was started by us in May, 2007. An interim report received from National Institute of Hydrology, Roorkee (a premier R&D institution under the Ministry of Water Resources, Govt. of India) has been received in Feb, 2008. Title of this report is "Regional Hydrogeological studies around Kasnau-Matasukh Lignite Mines, Nagaur distt. Rajasthan". This report includes the work carried out on the project which includes collection of different type of data like surface water data, ground water data, physiographic data etc. Besides the collection of data, work on environmental isotopes has been carried out by NIH. Finding of same are included in this report. A copy of this interim report has been submitted to CMPDI by us earlier. The results of pump tests and mathematical modeling are to be incorporated in this report.

Three more sets, each set comprising of one exploratory well and two observation wells have to be constructed and pump tests are to be carried out on same. This tube well construction work and pump tests are likely to be completed by Sept., 2009. Further period of 3 months will be required for evaluation and compilation of data. We are planning to conclude the study by December, 2009. But considering any unforeseen circumstances and other eventualities, it may kindly be considered to extend the study period upto the end of March, 2010. The forthcoming Lok Sabha elections also

affected the tubewell construction programme as the Officers and staff have been deployed for election duty and the Ground Water Department has also deployed its drilling rigs on priority areas related to drinking water projects.

The CGWB have extended the period of MOU upto March, 2010 vide their letter No. 89/CGWB/SAM/2009-1520 dated 09.03.09.

11. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Construction of tube wells i.e. exploratory wells, observation wells and peizometer	Apr 2009	Sep 2009
2.	Conducting of pump tests	Jun 2009	Sep 2009
3.	Analysis of Water Samples	Jun 2009	Sep 2009
4.	Evaluation of data and report preparation	Oct 2009	Dec 2009

Coal Beneficiation & Utilisation

S&T Annual Report

2008-09

1. **Name of the Project** : **Application of vorsyl separator for recovery of clean coal from middlings and rejects**
2. **Date of start** : Oct 2004
3. **Scheduled date of completion** : Sep 2006
4. **Revised date of completion** : March 2009/March 2008
5. **Implementing Agency** :
 - a. Advanced Materials & Process Research Institute (AMPRI) (formerly RRL), Bhopal
 - b. Central Mine Planning & Design Institute Ltd., Ranchi
6. **Project Leader/Co-ordinator** :
 - a. Dr. J.P. Barnwal, RRL, Bhopal
 - b. General Manager (CMP), CMPDI, Ranchi
7. **Total Approved Cost** : Rs. 125.40 lakh
S&T Grant : Rs. 94.765 lakh
DST Contribution - Rs. 30.635 lakh
For AMPRI, Bhopal : Rs. 85.40 Lakh
For CMPDI : Rs. 40.00 Lakh

DESCRIPTION OF THE PROJECT

8. Objectives

- Install 300-400mm dia Ni Hard Vorsyl Separator with necessary instrumentation.
- Conducting test on vorsyl separator using three widely varying feed characteristics of washery middlings/rejects samples.
- Optimizing the performance of vorsyl separator
- Development of mathematical models and scale up strategy for vorsyl separator vis-a-vis feed coal characteristics.
- Evaluate the performance vorsyl separators.
- Demonstrate the application of vorsyl separator to the coal industry for recovering coal from washery middlings and rejects.

9. Status as on 31.03.2009

Dugda Coal Washery has been selected for implementation of the project. Design of vorsyl separator has changed and finally it has been decided to install 450 mm vorsyt supinator at Dudda washery, BCCL. No substantial work has been done under the project.

10. Slippage, if any :

Initially, the project has got delayed due to finalisation of size of the Vorsyl Separator. Finally it has been decided to install 450mm Vorsyl Separator at Dugda Washery, BCCL. The project implementation got delayed due to delay in procurement of equipment and poor response the tenders floated by RRL, Bhopal.

11. Action Plan for 2009 – 10

The following activities will be carried out during 2009-10

- (i) Tendering for installation of vorsyl separator plant
- (ii) Installation of plant
- (iii) Procurement of coal samples and its characterisation studies.
- (iv) Test operation & Modelling studies.
- (v) Report preparation.

1. **Name of the Project** : **Agglomeration formation in reducing condition in pressurised fluidised bed gasification (PFBG) with low rank high ash Coals.**
2. **Date of start** : Nov 2003
3. **Scheduled date of completion** : Oct 2006
4. **Revised date of completion** : Sep 2009/March 2009/March 2008
5. **Implementing Agency** : CIMFR, Dhanbad
6. **Sub-implementing Agencies** :
i. Centre for Energy Technology, Osmania University, Hyderabad
ii. Central Mine Planning and Design Institute Ltd.
7. **Project Leader/Co-ordinator** : Sri P. D. Chavan, CIMFR
Sri S. Dutta, CIMFR
Sri K. Basu, Project Manager
Centre for Energy Technology,
Osmania University, Hyderabad
8. **Total Approved Cost** : Rs. 338.58 Lakh
CIMFR – Rs. 283.48 Lakh
CET, Osmania Uni - Rs. 42.71 Lakh
CMPDI – Rs. 12.39 Lakh

DESCRIPTION OF THE PROJECT

9. Objective

- Validation of Reactivity of various coals under reducing conditions
- Mechanism of agglomerate and clinker formation, under pressure and in reducing atmosphere due to coal properties and reactor design, and
- Mechanism of elutriation with different ash content (different coals)

10. Status as on 31.03.2009

Installation of the PFBG system is completed and commissioning of the system is in its final stage. After commissioning experimental work will be conducted with different coal samples.

Characterization of the coal samples, mathematical modeling is in progress.

11. Slippage if any

- (i) NIT preparation of the (previously approved) was delayed as the design and specifications are unique in nature.
- (ii) Processing of NIT got held up due to some changes in the CSIR guidelines on turnkey activity.
- (iii) The previous Project Leader was transferred on 30th August 2005. On 30th November 2005 project team was formed consisting new Project Leaders and Project Co-ordinators.
- (iv) Revision of specifications of PFBG setup (from 200mm reactor dia to 100mm reactor dia) due to financial constraints and its approval (27.11.06)
- (v) Revised NIT re-tendered for further processing and order placed to M/s Chemito, Nasik. For installation, commissioning of PFBG.
- (vi) During commissioning reactor tube got damaged (Hole occurred in bed section of tube). After rectification of the reactor tube, it has been reinstalled & now commissioning of the plant is in final stage.

12. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Mathematical Modeling	Aug 2007	Continue
2.	Characterization of Different Coals	Dec 2006	Continue
3.	Experiments with different coal	Apr 2009	Continue
4.	Validation of mathematical models	Apr 2009	Continue

1. **Name of the Project** : **Production or [60], [70] fullerenes, Hetro fullerenes and cabron nanotubes from coal**
2. **Date of start** : May 2007
3. **Scheduled date of completion** : Apr 2010
4. **Implementing Agency** : CIMFR, Dhanbad
5. **Sub-Implementing agency** : BHU, Varanasi
6. **Project Leader/Co-ordinator** : Shri Ashisk Kumar Ghose, CIMFR/ Prof. O.N. Srivastava, BHU
7. **Total Approved Cost** : Rs. 175.80 Lakh
For CIMFR - Rs. 145.92 Lakh
For BHU- Rs. 29.88 Lakh

DESCRIPTION OF THE PROJECT

8. Objectives

The objective of the project in to produce soot enriched in [60], [70] Fullerenes, Hetrofullerenes and Nanotubes involving indigenous designed reactor system.

9. Status as on 31.03.2009

As an exploratory study three coal sample from (i) Jharia XI seam, TATA Jamadoba Colliery, (ii) Zero seam Bastacola Colliery and (iii) NE region was collected and beneficiated by gravity separation method followed by carbonization (at 3mm) to generate the coke which was finally crushed and sieved (72 BS). From the coke powder rods of dimension 3cm length and 0.5cm diameter were successfully fabricated. As a pilot study several arching experiments were done with the rods in the reactor system at the lab of Prof. O. N. Srivastava, BHU, Varanasi. Traces of multiwalled carbon nanotubes has been detected in the Transmission Electron Micrograph (see figure 1) of the soot obtained from the pilot run of the coal samples.

The findings were presented by the PL in 9th international conference on nanostructured materials (NANO-2008) at Rio de Janeiro, Brazil.

10. Slippage, if any

Procurement of equipment such as Fluorescence Spectrophotometer, UV-Vis Spectrometer and Fullerene reactor system could not be done timely at CIMFR due to delay in purchase procedure.

11. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Carrying out experiments in fullerene reactor system	Jan 2009	Apr 2010
2.	Product analysis and characterisation	Jan 2009	Apr 2010
3.	Selection of suitable 'host' compounds	Jan 2009	Oct 2009
4.	Separation of fullerenes by utilizing 'host-guest' chemistry	Jun 2009	Feb 2010
5.	Analysis of data & preparation of reports	Apr 2010	May 2010

1. **Name of the Project** : **Pulse detonation combustion of coal for energy application.**
2. **Date of start** : **March 2008**
3. **Scheduled date of completion** : **Feb 2010**
4. **Implementing Agency** : **IISc, Bangalore**
5. **Project Leader** : **Prof. T.S. sheshadri, IISc Bangalore**
6. **Total Approved Cost** : **Rs. 22.80 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives

- To setup facility for pulse detonation combustion of coal with technology and research goal.
- To achieve constant volume combustion of coal and thus attain higher energy efficiency.
- To study of detonation structure in coal air mixtures and coal detonation chemical kinetics at higher temperature & Pressure and diffusion process.

8. Status as on 31.03.2009

Newly started project, progressing on per schedule.

9. Slippage, if any

Nil

10. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Measurement of Energy Efficiency	Jan 2009	Sep 2009
2.	Basic Studies	Jul 2009	Dec 2009
3.	Final Design and Demonstration	Jan 2010	Mar 2010

1. **Name of the Project** : **Catalytic Liquefaction of Neyveli Lignite**
2. **Date of start** : Feb 2009
3. **Scheduled date of completion** : Jan 2012
4. **Implementing Agency** : Mepco Schlenk Engineering College, Sivakasi
5. **Project Leader/Co-ordinator** : Dr. N. Krishnamurthy
Mepco Schlenk Engineering College, Sivakasi
6. **Total Approved Cost** : Rs. 14.00 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

- Study of depolymerization of Neyveli lignite using phenol and catalysts such as p-toluenesulphonic acid, sulphated zinconia and MCM-41 supported HPA.
- Characterization of the products of depolymerization.
- Liquefaction of the depolymerized product by alkylation using olefins as the alkylating agents.
- Analysis of the products by GC/MS.
- Optimization of the reaction parameters for high conversion and better liquefaction.
- Consolidation of reports and submission of the same to CMPDI.

8. Status as on 31.03.2009

Two project assistants have been recruited. Progressing as per schedule.

9. Slippage, if any

Nil

10. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Literature Survey	Apr 2009	Jun 2009
2.	Purchase of Chemicals and Glassware	Jul 2009	Sep 2009
3.	Preparation and characterization of catalysts	Oct 2009	Mar 2010

1. Name of the Project	:	Biological Production of Clean Fuels from Lignite
2. Date of start	:	Feb 2009
3. Scheduled date of completion	:	Jan 2012
4. Implementing Agency	:	RV College of Engineering, Bangalore
5. Project Leader/Co-ordinator	:	Prof. (Dr.) Pushpa Agrawal RV College of Engineering, Bangalore
6. Total Approved Cost	:	Rs. 45.36 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

- To design the anaerobic bioreactors for the conversion of lignite into clean fuels.
- Optimization of the parameters such as amount of moisture content, temperature, pH and hydrogen concentration.
- Isolation of the bacteria from the gut of the termites and their pure culture and maintenance of their population.
- Utilization of the isolated bacteria for the conversion of the lignite under optimized conditions.
- Estimation of the byproduct obtained after the lignite.
- Complete elimination of reductions of the impurity like sulphur.
- Cost effective production of the fuels using the existing and modified organisms.
- Estimation of the efficiency of the clean fuels that are environmental friendly.

8. Status as on 31.03.2009

Newly started project, progressing as per schedule.

9. Slippage, if any

Nil

10. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Preliminary Studies	Feb 2009	Oct 2009
2.	Isolation of the bacterial organisms	May 2009	Apr 2010
3.	Design of the bio-convertor plant (anaerobic reactor)	May 2009	Oct 2010
4.	Optimisation of the parameters	Aug 2009	to be continued
5.	Fuel accomplishment	Nov 2009	to be continued
6.	Characterisation of the fact	Nov 2009	to be continued

Sl. No.	Activity	Date of start	Date of completion
1.	Literature Survey	Feb 2009	Apr 2009
2.	Preliminary Studies	Feb 2009	Jul 2009
3.	Study feedback parameters	May 2009	Nov 2009
4.	Obtain data analysis	Apr 2009	Apr 2009
5.	Design of biomass gasifier for dual gas operation	May 2009	Jan 2010
6.	Study the operation of L-fermentation dual fuel mode gasification unit	Dec 2009	Apr 2010

1. **Name of the Project** : **Re-design and Fabrication of Biomass Gasification Plant Coal Fuel Utilization.**
2. **Date of start** : Feb 2009
3. **Scheduled date of completion** : Jan 2010
4. **Implementing Agency** : RV College of Engineering, Bangalore
5. **Project Leader/Co-ordinator** : Dr. M. Krishna, Director,
RV College of Engineering, Bangalore
6. **Total Approved Cost** : Rs. 40.06 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

- To design and develop co-gasification (Dual Fuel : Coal/Lignite + Bio-waste) technology by using existing biomass gasification unit.
- To optimize carbon/biomass ratio for efficient power generation.
- To develop an efficient gas cleaning technology.
- To increase power generation capacity (power out put/size of the system).

8. Status as on 31.03.2009

Newly started project, progressing as per schedule.

9. Slippage, if any

Nil

10. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Literature Survey	Feb 2009	Apr 2009
2.	Preliminary Studies	Feb 2009	Jul 2009
3.	Study Feedstock parameters	May 2009	Nov 2009
4.	Obtain data analyses	May 2009	Nov 2009
5.	Re-design of biomass gassifier for dual mode operation	May 2009	Jan 2010
6.	Study the operation of Lignite/Biomass dual fuel mode gassification unit	Dec 2009	Apr 2010

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1. Name of the Project	:	Fly ash characterization for mine void reclamation
2. Date of start	:	Nov 2003
3. Scheduled date of completion	:	Oct 2006
4. Revised date of completion	:	Jan 2010/Oct 2008
5. Implementing Agency	:	CMPDI Ltd.
6. Project Co-ordinator	:	GM (Env.), CMPDI Ltd. Ranchi
7. Total Approved Cost	:	Rs. 287.684 Lakh

DESCRIPTION OF THE PROJECT

8. Objectives

- To identify and characterize samples of power grade coal from mines from major coalfields in India producing power grade coal and supplying coal to identified TPS.
- To characterize the PFA produced from coal from indentified mines and establish relationships between trace elements present in coal and its PFA.
- To carry out standard leaching tests on ash samples and characterize the leachate produced with respect to its potentialities in polluting ground water.
- To test the properties of PFA to assess its suitability as material for structural fill so that end uses of reclaimed land other than growing plantation, can be thought of, including development of townships on such land.
- Foreign grade coal to be tested w.r.t. the above three issues, to compare its eco-friendliness vis-a-vis Indian coal.
- To analyze slope stability of the dump formed by backfilling fly ash (PFA) and dump material in two scenarios
 - Fly ash (PFA) and overburden material are mixed during the backfilling
 - Fly ash (PFA) and overburden material are dumped in layers.

9. Status as on 31.03.2009

BCCL and their respective thermal power plants are yet to be collected and this is expected to be completed shortly. Limited enquiry for physical analysis of fly ash for slope stability has raised. Due to single quotation (IIT, Roorkee) this out sourcing job is again to be re-tendered. Chemical & leachate analysis of coal and fly ash samples will be carried out after arrival of equipment.

10. Slippage, if any :

Delay in procurement of equipment.

11. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Procurement of the Equipment, Installation & Commissioning	Nov 2004	Oct 2009
2.	Sample Collection	Dec 2005	Apr 2009
3.	Analysis of Samples	Feb 2009	Jul 2009
4.	Interpretation of results	Aug 2009	Oct 2009
5.	Report Preparation	Sep 2008	Jan 2010

1. **Name of the Project** : **Development of suitable biological wastewater treatment technology through constructed wetlands for treatment of acid mine drainage from coal projects.**
2. **Date of start** : Aug 2004
3. **Scheduled date of completion** : Jul 2007
4. **Revised date of completion** : June 2009
5. **Implementing Agency** : CMPDI Ltd., Ranchi
6. **Sub-implementing Agency** : Western Coalfields, Nagpur
7. **Project Leader** : GM (Env.), CMPDI Ltd. Ranchi
8. **Total Approved Cost** : Rs. 78.62 Lakh

DESCRIPTION OF THE PROJECT

9. Objectives

- Design of Anoxic lime stone drain.
- Identification of plant species capable of bio-degrading the acid mine drainage.
- Design of organic substratum of wetland to support plant species.
- Assessment of treatment efficiency and operating parameters for treatment of the acid mine drainage by the plant species through bio-degradation.
- Development of a simple and cost-effective bio-treatment system to treat the acid mine drainage from the coal mines, so that it could be made potable.

10. Status as on 31.03.2009

(i) Literature Survey

It has been carried out through surfing on the internet, interacting with experts like National Botanical Research Institute, Lucknow, interacting with national and international experts. Literature survey by referring the libraries of reputed organization has been completed.

(ii) **Identification of Land**

The land has been identified with WCL authority during visit to mine site in January, 2008. The site clearance in respect of "no coal zone" has been obtained vide letter No. RIN/IV/ENV/S&T/MAORI/AMD/2008-09/379 dated 16.07.2008 from Regional Director, CMPDI, RI – IV, Nagpur.

(iii) **Collection & Characterization of Waste Water**

First round of sample collection and characterization has been completed. Second round of sampling has been completed during visit to CMPDI team in February, 2006. Analysis of mine water samples by outside laboratory has been completed.

(iv) **Identification of Plant Species**

The plant specie *Typha* has been identified for this purpose.

(v) **Design of Wetlands**

The design of weland system, based on the characteristics of AMD and availability of site has been completed. The same has been finalized after input from WCL authorities. The design, drawings, BOQ and cost estimates have been submitted to WCL for implementation.

(vi) **Implementation of the Scheme**

The implementation of the scheme is now in progress. The Kanhan Area, WCL authorities have invited tender on 30.04.2009. The tender opening is on 7th May, 2009. The work is likely to be awarded by 20.08.2009. The likely date of completion as communicated by WCL is 01.03.2010. The tentative action plan for implementation, as submitted by WCL is as under :

- Opening of Part – I : 07.05.2009
- Opening of Part – II : 15.06.2009
- Award of work : 20.08.2009
- Commencement of work : 01.09.2009
- Likely date of completion : 01.03.2010

11. Slippage, if any

- The Sukari Mine wherein this project was initially proposed to be executed got closed. WCL authorities intimated Maori Mine in Ambara Sub-Area (Kanhan Area) for executing the project in place of Sukari Mine.
- The specialized analysis of mine water samples by outside agency got delayed due to non-availability of suitable agencies. The sealed quotations were invited thrice but only single quotation could be received every time. This work has now been completed.
- The site for the construction of wetlands was finalized during visit to mine in January, 2008. However, the site clearance for "no coal zone" could be obtained only in July, 2008.

- The project is being implemented by WCL which is sub-implementing agency. For implementation of the project, design, drawing and BOQ were prepared and submitted to WCL in December, 2008. However, WCL sought certain clarifications on the project which was provided in February, 2009. The actions for implementation of the project could be started by WCL thereafter.

12. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Award of work for construction of wetland	Apr 2009	Aug 2009
2.	Construction of the treatment system	Sep 2009	Mar 2010
3.	Monitoring of the treatment process and its parameters	Mar 2010	Nov 2010
4.	Compilation of field data	Apr 2010	Nov 2010
5.	Preparation of report & submission	Jun 2010	Dec 2010

1. **Name of the Project** : **Investigation into low cost liner for disposal of coal ash in abandoned opencast mine.**
2. **Date of start** : **Oct 2006**
3. **Scheduled date of completion** : **Sep 2009**
4. **Implementing Agency** : **CIMFR, Dhanbad**
5. **Project Leader/Project Co-Ordinator** : **Dr. (Mrs.) Bably Prasad, CIMFR (CMRI)**
6. **Total Approved Cost** : **Rs. 44.14 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives

- (i) To develop an economically viable method of preparation of zeolite material from coal fly ash that can be used as liner for coal ash disposal in abandoned open cast.
- (ii) To evaluate the efficiency to prevent leaching of conaminants to ground water.

8. Status as on 31.03.2009

- Purchase of Equipment is in progress.
- Laboratory experiments to evaluate the major components like SiO_2 , Al_2O_3 , LOI, Fe_2O_3 has been completed in prepared fly ash zeolite.
- XRD and SEM analysis of prepared FAZ and FA has been completed.
- Cation exchange capacity of prepared FAZ has been carried out by using ammonium acetate method (IS : 2720).
- Preparation of Laboratory Bench scale fly ash filled in VAT with fly ash zeolite as linere has been prepared and experiment is under progress.
- Preparation of Laboratory Bench scale fly ash filled VAT without liner has been prepared and experiment is under progress.
- Leaching studies of fly ash filled VAT (with and without liner) on weekly basis and analysis of different contaminants in the leachate water collected from the bottom of VATs is going on.

9. Slippage, if any

Procurement of AAS is still in progress.

10. Detailed Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Purchase of AAS	Oct 2006	May 2009
2.	Laboratory Bench scale experiment	Jan 2008	May 2009
3.	Analysis of metals in leachates by AAS	Jun 2009	Sep 2009
4.	Data analysis and evaluation liner efficiency	Jun 2009	Sep 2009
5.	Compilation of result and report writing	Oct 2009	Dec 2009

- | | | |
|--|---|---|
| 1. Name of the Project | : | Study on blasting dust management system in an opencast coal mines. |
| 2. Date of start | : | Oct 2006 |
| 3. Scheduled date of completion | : | Sep 2009 |
| 4. Implementing Agency | : | NIRM, MCL & NCL |
| 5. Project Leader/Project Co-Ordinator | : | Mr. Surendra Roy, NIRM
Dr. G. R. Adhikari, NIRM |
| 6. Total Approved Cost | : | Rs. 48.33 Lakh |

DESCRIPTION OF THE PROJECT

7. Objectives

- To study the meteorological conditions at the mine sites.
- To assess the ambient air quality at the study site due to blasting.
- To study the influence of rock density and blast design parameter on dust emission.
- To develop emission factor for the quantification of dust emission due to blasting.
- To develop predictive estimation equation for the dust concentration at particular location.
- To find out central measures for the dust generation due to blasting.

8. Status as on 31.03.2009

Winter season data collection at Dudhichua Project, NCL

- The respirable dust samplers were installed nearby the blast locations. The particulate matter less than 10 micron size (PM_{10}) and total suspended particulate matter (TSP) were monitored.
- The mixing heights and atmospheric stability classes were monitored by the SODAR, which is installed at the roof of the CGM office.
- The wind speed, wind direction, temperature, humidity, solar radiation and rainfall was monitored by automatic weather station (AWS), which is installed at the roof of the time section office.
- The data on blast design parameters were collected in this season.
- At the project site, silt and moisture content of the blasted benches were determined in the coal laboratory of Dudhichua project.

9. Slippage, if any

Delay in procurement of instrument.

10. Detailed Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Collection of summer season data at Dudhichua Project, NCL and analysis	Apr 2009	May 2009
2.	Collection of rainy season data at Dudhichua Project, NCL and analysis	Jul 2009	Aug 2009
3.	Collection of post monsoon data at Bharatpur Opencast Project, MCL and analysis	Oct 2009	Nov 2009
4.	Collection of winter season data at Bharatpur Opencast Project, MCL and analysis	Jan 2010	Feb 2010

1. **Name of the Project** : **Development and use of fly ash based pesticides**
2. **Date of start** : **May 2007**
3. **Scheduled date of completion** : **Apr 2011**
4. **Implementing Agency** : **Annamalai Univ. (AMU), VCRC, Pondichery & NLC**
5. **Project Leader/Project Co-Ordinator** : **Shri V. Manoharan, Chief Manager (Sci/CARD/NLC/
Dr.P. Narayanasamy, Prof. Head, Deptt of Entomology
(AMU)/
Dr. P Jambulingam, Scientist F/VC RC, Pondichery.**
6. **Total Approved Cost** : **Rs. 297.72 Lakh**
S&T Grant : Rs. 268.13 Lakh
For NLC : Rs. 131.737 Lakh
For AMU : Rs. 82.62 Lakh
For VCRC : Rs. 53.82 Lakh
Cont NLC : Rs. 29.543 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

- To standardize methods to develop fly ash based pesticides.
- To formulate fly ash “ 100% dust insecticides”.
- To develop “herbal fly ash insecticides”.
- To develop “Microbial fly ash insecticides”.
- To develop and test bio-logical fly ash pesticides against mosquitoes.
- To test the fly ash based pesticides against pest problems in rice, groundnut, sugarcane, vegetables, cotton & pulses and in store godowns.
- To assess pesticides, residues in plant products, produce soil and water samples.

8. Status as on 31.03.2009

CARD/NLC, Neyveli

- (i) Works contracts for conducting field trial experiments awarded from the month of March, 2008 and ended on 28.02.2009. Estimates prepared for awarding works contract for conducting field, poly greenhouse and shade house trials for the year 2009-10.

- (ii) A biennial works contract for sampling and laboratory analysis was awarded from June, 2008.
- (iii) To study the effect of fly ash on pest incidence on crops, several experiments were conducted in poly Green house and shade house of CARD. The vegetable crops like Radish, Cauliflower and Cabbage, Capsicum, Bhenidi & Oil seed crops like Sunflower and Groundnut were tested with insects and fly ash dusting. Chewing insects like leaf hopper, hairy caterpillar were quick to move away from the crop canopy, while sucking insects like mealy bug and aphids reacted to flyash dusting but persisten on the crops. In the laboratory, *Spodaptera litura* fed with flyash treated leaves, though the larvae survived, the pupal stage was malformed.
- (iv) Joint Field surveys were conducted at periodical intervals to collect plant, soil and water samples in coordination with Annamalai University in and around Neyveli. Soil, water samples were analyzed for pesticide residues. It was found that several pesticides were detected but they were within the tolerance limits.
- (v) Apart from routine analysis like soil microbial count, NPK, micronutrients & heavy metals, a random sampling of around 10 soil and 50 plant samples comprising of trees like Vaagai, Peepal, Banyan, Neem, Tamarind, Teak, Sapota, Jack, Amla, Guava, Coconut, etc. of age ranging from 3-20 years were collected for CARD and analyzed for C, H, N, S O. Chlorophyll content of cops raised in Polygreen house and shade house were recorded.
- (vi) Indent raised to purchase Chemicals and glass wares – enquiry issued and some of the chemicals were received.
- (vii) Digital image recorder purchase – re-enquiry issued.
- (viii) For procuring SEM the PQ was modified and re-enquiry to be issued.

(ix) **Annamalai University**

Construction of concrete shed for the flyash pesticides production was completed and has been occupied. Necessary research provisions have been made. Regarding erection of ball mill, pulveriser, fractionator, blender and sealer, they were expected to be installed soon. Construction of Greenhouse was in completion stage and would be utilized soon for research activities.

(x) **Vector Control Research Centre, Puducherry**

Purchase of equipments and their accessories was completed.

Bacillus thuringiensis var. israelensis (VCRC B17) was mass multiplied in Soya medium, WDP formulations were prepared and tested against three species of mosquito larvae. After completion of toxicological studies, it would be field tested in Neyveli, Chidambaram and Puducherry as per project scope. It was found from the studies that flyash of size 10-37 μm was optimal for preparing fomulations for use against mosquito vectors.

9. Slippage, if any

Nil

10. Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
<u>CARD/NLC</u>			
1.	Co-ordinating in the conduct of lab & field experiments involving flyash based pesticides in field crops & mosquitoes.	May 2007	Apr 2010
2.	Co-ordinating with Health/TA/Mines/AU/VCRC for study pest/mosquito control.	Aug 2008	Oct 2010
<u>Annamalai University</u>			
1.	Screening of biopesticide strains and supply to NLC. Development of various flyash dust and flyash based biopesticides at lab and characterization under progress.	May 2007	Oct 2010
2.	Production and evaluation of various flyash pesticides against mosquitoes and the pest of rice, groundnut, vegetables, cotton, sugarcane and pulses under progress.	Apr 2008	Jul 2010
3.	Evaluation of various fly ash based biopesticides against the pests of crops – rice, groundnut, pulses and vegetables, stored food grains and against mosquitoes.	Jun 2009	Oct 2010
4.	Demonstration of use of fly ash pesticides and fly ash based bio-pesticides against pests of selected crops, warehouses and vector control. Comparative studies on fly ash pesticides with commonly used pesticide residue.	Aug 2008	Oct 2010
5.	Testing at regional pesticide lab & supply of fly ash pesticides to farmers' use and dissemination.	Jun 2009	Jul 2010
<u>VCRC</u>			
1.	Laboratory evaluation and formulation of mosquitocidal toxins from bacteria for activity against immature stages of mosquitoes is under progress.	Sep 2008	Apr 2010
2.	Field evaluation of the formulations of the mosquitocidal toxins.	May 2009	Jun 2011

1. **Name of the Project** : **Survey and ecological conservation of NLC environment through bio-remediation with tree species.**
2. **Date of start** : **May 2007**
3. **Scheduled date of completion** : **Apr 2010**
4. **Implementing Agency** : **NLC & Tamil Nadu Agriculture University (TNAU)**
5. **Project Leader/Project Co-Ordinator** : **Shri K.C. Radhakrishnan, DGM, CARD, NLC
Dr.S. Santhanam, DGM, CARD, NLC
Shri V. Manoharan, CM, CARD, NLC**
6. **Total Approved Cost** : **Rs.77.87166 Lakh
For NLC : Rs. 25.30 Lakh
For TNAU: Rs. 52.57166 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives

- (i) To survey the ecological diversity of NLC as influenced by air born contaminants viz CO₂, SO₂, NO_x
 - (a) Survey of the vegetation pattern of NLC
 - (b) Identification of bio-indicators.
 - (c) CO₂ distribution through infra red imagery.
- (ii) To study the Photo-remidiation efficiency of the existing green belt of NLC to air born contaminants viz CO₂, NO₂ and SO₂ and soil born contaninants.
 - (a) Absorption efficiency of vegetation for in pollutants.
 - (b) Apsorption efficiency for CO₂ by afforested tree species.
- (iii) To evaluate tree species and fruit saplings to tolerance to air and soil born contaminants for sustaining for clean environment in and around NLC.
- (iv) To study short-term and long-term effects of air and soil born pollutants on tree species and fruit crops.

8. Status as on 31.03.2009

I (a) Purchase

Purchase of instruments has been completed.

I (b) Survey and Vegetation Mapping

MoU has been signed with M/s Salim Ali Center for Ornithology and Natural History (SACON), Hyderabad. Work on vegetation mapping has been commenced by M/s Salim Ali Center for Ornithology and Natural History, Hyderabad. The work will be completed within three months.

II. Glass House Experiments using OTV

Fifty four tree species have been evaluated for pollution tolerance using open top chamber. The study will be completed by October, 2009 as per schedule as per the time schedule.

III. Evaluation of Existing Tree Species and Fruit Saplings Existing at NLC for Phytoremediation Efficiency to Air Pollutants

Analysis and compilation of data will be completed. There is no slippage in the execution of work.

IV. Mass Multiplication of Tree Species through Tissue Culture

A new Tissue Culture Laboratory has been established and furnished with all equipments/instruments. The work has been initiated as per schedule.

9. Slippage, if any

The vegetation mapping work through IR imagery is executed by M/s SACON, Hyderabad. The MoU has been signed. The work on the initial ground survey is in progress covering 450 km² area of Neyveli Lignite Corporation.

10. Detailed Action Plan for 2009 – 10

The following activities are proposed to be carried out in 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Survey and vegetation mapping of NLC flora and fauna	Jun 2009	Sep 2009
2.	Mass multiplication of tree species through Tissue Culture	Nov 2008	Jan 2010
3.	Evaluation of existing trees and fruit saplings existing at NLC for phyto remediation efficiency to air pollutants	Nov 2007 Analytical Work is in progress	Oct 2009
4.	Compilation of data and final report preparation	Dec 2009	Apr 2010

1. **Name of the Project** : **Low cost input technology for re-vegetaion of coal mine spoils in order to protect the environment.**
2. **Date of start** : **May 2007**
3. **Scheduled date of completion** : **Apr 2010**
4. **Implementing Agency** : **TM Bhagalpur Univ., MCL & NCL**
5. **Project Leader/Project Co-Ordinator** : **Prof (Dr.) A.K. Roy**
University Department of Botony TM Bhagalpur Univ.
Bhagalpur.
6. **Total Approved Cost** : **Rs. 26.263 Lakh**

DESCRIPTION OF THE PROJECT

7. Objectives

- Eco-diversity of micro-flora on different aged OB dumps relation to developing native or artificially raised vegetation.
- To screen out common efficient micro-flora used as bio-tools for the establishment of plant species on OB dumped.
- Development of eco-friendly micro-bial package for the restoration of vegetation on OB dump or mine spoils at regional & national level to sustain the effect of variable biotic & abiotic factors.

8. Status as on 31.03.2009

- (i) 1st Annual Report has been submitted on time.
- (ii) Development of bio-inovulant package is underway-isolation, identification and mass multiplication of native microflora (Fungi, Bacteria and VAM fungi).
- (iii) Plants for revegetation have been selected accordingly seeds of the plants are procured.
- (iv) Polybag experiment under green house condition is under progress.
- (v) Preparation of 2nd Annual R#eport is under progress and submission of the same will be done as per the schedule of the Project.

9. Slippage, if any

Nil.

10. Detailed Action Plan for 2009 - 10

Sl. No.	Activity	Date of start	Date of completion
1.	Establishment of Microbial Consortium	May 2009	Mar 2010
2.	Field Trials	Jun 2009	Mar 2010
3.	Compilation of data	Oct 2009	Mar 2010
4.	Preparation and submission of Final Technical Report	Feb 2010	Apr 2010

1. **Name of the Project** : **Development of Methodology for Estimation of Greenhouse Gas Emissions in Mine Fire Areas and their Mitigation through Terrestrial Sequestration.**
2. **Date of start** : **Feb 2009**
3. **Scheduled date of completion** : **Jan 2012**
4. **Implementing Agency** : **Central Institute of Mining & Fuel Research, Dhanbad**
5. **Sub-Implementing Agency** : **Department of Botany, Banaras Hindu University, Varanasi**
6. **Project Leader** : **Dr. Siddarth Singh**
7. **Project Co-Ordinators** : **Dr. A. K. Singh, Scientist E1
Dr. B. K. Tewary, Scientist F**
8. **Total Approved Cost** : **Rs. 341.77 Lakh**

DESCRIPTION OF THE PROJECT

9. Objectives

- (i) To estimate Greenhouse Gases (CO₂, CH₄ & N₂O) emission from coal mine fire areas, inventorization and its temporal and spatial dispersion at ground level.
- (ii) To estimate in real time the load of combustion aerosol (black carbon, sulphates and nitrate) emissions from mine fire area.
- (iii) To quantify the existing greenhouse gases sinks using space born data and estimate its carbon sequestration potential.
- (iv) To develop GHG's Emission Factor for coal mine fires.
- (v) To standardize terrestrial CO₂ sink management practices under Landuse, Landuse Change and Forestry and facilitate future emission trading.

10. Status as on 31.03.2009

● Development of Monitoring Protocol

Detail literature survey is continued since the inception of the project at various interphases. The aim of literature survey is to establish instrumentation and monitoring protocol to develop methodology for the estimation of Greenhouse Gas emission from coal mine fire areas.

● Recruitment of Project Staff

For the recruitment of project staff advertisement has been made in the Employment News and other news papers in February, 2009. More than two hundred application forms were received. Application forms are being scrutinized and candidates are likely to be appointed in the next quarter.

● **Procurement of Instruments**

Extensive literature survey has been done to collect information regarding the best available technology to be implemented in the project. Detailed information has been collected from the personal communication to the manufacturers and users of instruments in India and abroad. Visits have been made to few advance research labs to see the working of latest analytical and measurement techniques. Indents for procurement of approved instruments are finalized and are ready for processing.

11. Slippage, if any

Nil.

12. Detailed Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Literature review, Collection of Maps and other relevant documents from BCCL and ECL.	Apr 2009	Mar 2010
2.	Recruitment of Project Staff	Feb 2009	Jun 2009
3.	Preliminary visits to mines for selection of sampling sites for emission monitoring due to mine fire.	Apr 2009	Jun 2009
4.	Selection of monitoring sites for horizontal GHG dispersion studies at ground level. Selection of sites for installation of Automatic Weather Stations at both the sites.	Apr 2009	Jun 2009
5.	Chalking out the Specifications for instruments which involve literature survey and interaction with users and manufacturers.	Feb 2009	Apr 2009
6.	Submission of indents and Procurement of Instruments and installation in the laboratory.	Apr 2009	Mar 2010
7.	Collaboration with a Govt. agency to carry out the sink quantification and NDVI estimation of the mine fire sites of Jharia and Raniganj coalfield.	Apr 2009	Sep 2009
8.	Procurement of Remote Sensing data for Land Use characterization and output in the GIS environment.	Jul 2009	Mar 2010
9.	Collection of coal samples and their combustion in controlled condition in laboratory for estimation of GHG emission.	Jul 2009	Sep 2009
10.	Initiate the Selection of the Project Developer to develop Project Idea Note (PIN) and Project Concept Note (PCN) and prepare Project4 Design Document (PDD) for the submission at UNFCCC	Oct 2009	Mar 2010
11.	Meeting of the Implementing Agencies to prospect the protocol of work to be done.	May 2009	May 2009
12.	Meeting of the Implementing Agencies to review the progress achieved.	Dec 2009	Dec 2009
13.	Quarterly Report Submission	Jul 2009 Oct 2009 Jan 2010 Apr 2010	Jul 2009 Oct 2009 Jan 2010 Apr 2010

1. **Name of the Project** : **Carbon Sequestration in Revegetated Coal Mine Wastelands.**
2. **Date of start** : Feb 2009
3. **Scheduled date of completion** : Jan 2012
4. **Implementing Agency** : Central Institute of Mining & Fuel Research, Dhanbad
5. **Project Leader** : Dr. Raj Shekhar Singh
6. **Project Co-Ordinator** : Dr. B. K. Tewary
7. **Total Approved Cost** : Rs. 64.76 Lakh

DESCRIPTION OF THE PROJECT

8. Objectives

- To quantify the carbon storage in soils of different aged revegetated mine spoils.
- To estimate the carbon storage by different plant species in revegetated mine spoils along an age gradient.
- To explore the amount of soil biomass carbon in different aged mine spoils.
- Estimation of carbon in different component of plants of revegetated mine spoils.
- To estimate the carbon storage and flux potential of the revegetated mine spoils.

9. Status as on 31.03.2009

- Collection of literature is done and still continuing.
- One site of ECL (Mugma) has been selected.
- Literatures for the procurement of the equipment from different firms are collected.
- Proforma for recruitment of project staff is submitted for advertisement.

10. Slippage, if any

Nil.

11. Detailed Action Plan for 2009 – 10

Sl. No.	Activity	Date of start	Date of completion
1.	Collection of literature, Recruitment of Project Staff, Processing of equipments	Feb 2009	Jan 2010
2.	Selection of sites	Feb 2009	Jan 2010
3.	Monitoring of plant growth (height & growth)	Aug 2009	Jan 2010
4.	Collection of plant root and soil samples	Aug 2009	Jan 2010

S&T Completed Projects during 2008-09

S&T Annual Report

2008-09

1. **Name of the Project** : **Studies on the advance detection of fires in coal mines with special reference to SCCL.**
2. **Date of Start** : Sep 2002
3. **Date of Completion** : Nov 2007
4. **Implementing Agency** : Andhra University, Visakhapatnam
5. **Project Leader** : Prof. Dr. N. Someswara Rao, Andhra University
6. **Total Approved Cost** : Rs. 166.5088 Lakh

DESCRIPTION OF THE PROJECT

7. Objective

To assess the relation between fire in the mine with the composition of the evolved gases. From an understanding of such a relation it will be possible to predict the fire in the mine by analysing the composition of the gases with reference to their nature and concentrations.

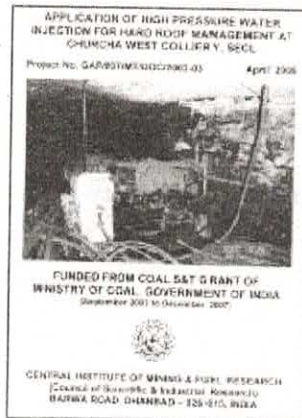
8. Work Done

- Coal samples from SCCL mines were collected and tested for leachet analysis of organic components, inorganic component of coal and for pyrolysis product of coal.
- Solid state C^{13} NMR & 2FT-IR spectral study of coal were conducted to find out complex moieties present in coal which responsible for emission of gas like H_2 and CO etc.
- Thermo gravimetric analysis, differential thermal analysis, scanning calorimetric studies have been conducted.
- For assessing the composition of inorganic components, trace components, analysis by using automatic absorption spectrometer (AAS) coupled with Plasma spectrometer with Mass Spectrometry detector have been done.
- Studies on $C_2 - C_{10}$ Hydrocarbons of different coal sample has been done.

9. Findings

The objective of the project was to assess the relationship between fire in the mine and the composition of evolved gases. From an understanding of such a relation it would be possible to predict a likely spontaneous heating/fire in a mine in advance.

After analyzing a huge number of coal and gas samples from different underground mines of SCCL, the mechanism of spontaneous combustion of coal was explained in the report. Eight indicators like, free radical concentration, the ratio of SiO_2/Al_2O_3 in the ash, the total concentration of $C_4 - C_{10}$ hydrocarbons etc. for assessing the proneness of coal for spontaneous combustion were identified. These indicators can be used for predicting spontaneous heating in underground mines in advance.



Application of high pressure water injection for hard roof management at Churcha West Colliery, SECL

CIMFR

Funded from Coal S&T grant of Ministry of Coal

BACKGROUND OF THE PROJECT

Hard and massive rocks are frequently encountered in Indian coal measure rocks within the active caving zone with sandstone content varying from one locale to another. This overlying hard roof is found difficult-to-cave after the coal is extracted. This delayed caving of roof leads to spalling at coal faces, overriding of pillars, large area roof falls and increase chances of air blast. To solve these problems, goaf injection or injection after extraction was planned at Churcha West Mine of South Eastern Coalfields Limited (SECL) in this project to achieve the following objectives:

To establish high pressure water injection technique to improve cavability of hard and massive roof overlying the coal seam.

To formulate norms and guidelines for water injection procedure and its parameters.

RESEARCH FINDINGS

The hydrofracturing process consists of following steps:

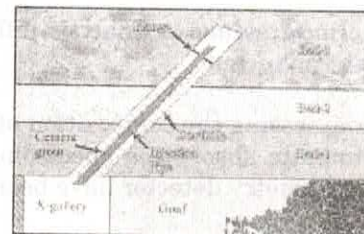
1. In case of B&P working, drilling of inclined boreholes from the junctions, perpendicular to the goaf line. While in case of Longwall working drilling of vertical/near vertical boreholes inclined towards goaf along the face. The depth and inclination should be such as to ensure a minimum of 7m to 10m of distance from free face over the goaf. The spacing of the holes would depend upon the radius of influence. The other parameters for design and planning of hydrofracturing at any locale can be determined from the calculated hydrofracturing parameters as mentioned above and from the existing stress profile over the goaf before hydrofracturing.

2. Grouting of injection pipes and connecting high pressure hoses.

3. In case of B&P working, extraction continues till the injection point goes just behind the goaf edge reaches. While in case of Longwall mining the face is retreated a minimum of half the periodic weighting span after the last periodic fall.

The study revealed the following:

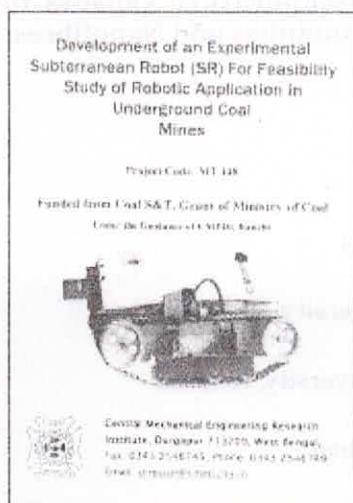
1. Both numerical modelling as well as field observations indicated that the convergence at the goaf edge increases rapidly with the extent of hydrofracturing. This is because due to hydrofracturing the stiffness of



the influenced zone in the roof decreases and has higher convergence before fall as experienced in a weak roof condition in comparison to a strong roof.

2. The overhang of the main roof before a fall in non-hydro fracturing zone is much higher compared to that in a hydrofracturing zone. It can be concluded that due to hydrofracturing there were regular falls in the goaf which resulted in reduced overhang.

Thus, it has been established through research work that hydraulic fracturing offers improvement in cavability of hard and massive roof overlying the coal seams.



Development of an experimental subterranean robot (SR) for feasibility study of robotic application in underground coal mines – CMERI, Durgapur; CMPDI and CMRI

Funded from Coal S&T grant of Ministry of Coal under the guidance of CMPDI Ranchi

BACKGROUND OF THE PROJECT

Flooding in active mines, subsidence, roof collapse and explosions are the major causes for accidents leading to death and injury of miners. The Mines Act holds the owner, agent and manager of a coalmine as accountable for enforcing safety in the mines. For example regulation 41, suggests that the manager of every mine to visit and examine workings below ground at least four days in a week to see that safety in every respect is ensured. The office of DGMS is reported to be constantly in short of manpower. In 1996 the Director General said that the office needs more than 800 people to look after safety measures in 6600 mines all over the country, but there are only 131 workers (The Economic Times, 19.1.97).

It was therefore felt that a remotely operated mobile robot (vehicle) with appropriate sensors and communication capability could be a very useful tool for safer and efficient operation of underground coalmines in India.

- a. In case of water logged mines it is capable of exploring the full tunnel and send valuable information through acoustic communication network created across the galleries.
- b. Simultaneously same information may be relayed to the mines managers' office instantly.
- c. Due to the all terrain capability this system can propel itself across water obstacles.
- d. In a post disaster scenario, the system is capable to locate trapped miners and send current status to the control station using acoustic telemetry link to organize a quick and well-directed rescue mission.

CONCLUSIONS/ RECOMMENDATIONS

1. RF Communication is most suitable for communication between the SR and the command station
2. The wheels equipped with a swivel mechanism are most appropriate for dry running inside the tunnels
3. Two separate modules/units will be helpful for water logging tunnels and dry tunnels. The unit for moving in tunnel water should have thrusters only for movement and the unit for dry tunnel will be using motors only. This will make both the systems compact and with larger endurance time.

1. **Name of the Project** : **Development of room temperature sensors for Methane using Carbon Nanotubes and Nanofibres.**
2. **Date of Start** : Nov 2005
3. **Date of completion** : Oct 2008
4. **Principal Implementing Agency** : Jadavpur University, Kolkata
5. **Sub-implementing Agency** : Indian School of Mines University, Dhanbad
6. **Project Leader** : Prof. A. K. Pal, Jadavpur University, Kolkata
7. **Project Co-ordinator** : Prof. P. S. Gupta, ISM, Dhanbad
8. **Total Approved Cost** : Rs. 85.6805 Lakh

for Jadavpur University – Rs. 71.2045 lakh
for ISM – Rs. 14.476 lakh

DESCRIPTION OF THE PROJECT

9. Objective

- Synthesis and characterization of carbon nano-tubes and nano-fibres by adopting cost effective and scalable electro deposition technique for methane gas sensor applications will be done.
- Prototype of sensors will be developed by using the discrete component that are available in Indian market.
- This prototype will be subjected to field tests in coal mines ascertain the viability of the use of such sensors developed under this project.

10. Work Done

CNTs and CNFs were synthesized by electrolysis (16) using acetonitrile (1-10% v/v) and deionized water as electrolyte. Purity of acetonitrile ~99% and water was 1 to 100 ml i- Q. Electrolysis was carried out at atmospheric pressure and the bath temperature was kept between ~300 to 350K. The electrolyte bath was a rectangular glass vessel of average dimension of 10cm x 2cm base with height ~7cm. Wall thickness of the glass bath was 1mm. The above electrolytic bath was fitted with teflon cap through which the electrodes were introduced. Carbon nanotubes were deposited on Si (001) wafers (resistivity ~15-100 ohm-cm size ~100mm x 8mm x 0.3mm) or SnO₂-coated glass substrate (1cm x 2mm : thickness ~2mm) attached to a copper cathode. Copper cathode was made of an electrolytic copper bar of dimension ~1cm x 10cm : thickness ~3mm. Graphite was used as the counter electrode (anode). The size of the graphite was 1cm x 10cm and thickness 3mm. Before mounting the substrates on the cathode, they were thoroughly cleaned and rinsed with de-ionized water and ethanol solution

respectively. Ethanol used is 99.5% pure. The electrodes were separated by a distance of ~8 to 10mm. The supply capable d.c. voltage between the electrodes was kept ~10 to 30 V by using a d.c. power supply capable of generating stabilized voltage (30V, 2A). The deposition was carried for ~4-6 hrs. The typical thickness of the films as measured by an interferometer was 100 to 300nm.

11. Findings

The objective of the project was to develop prototype Carbon Nano Tubes (CNT) Carbon Nano Fibres (CNF) for detection of methane at room temperature in underground mines.

The prototype sensors (CNT & CNF) were developed by Jadavpur University, Kolkata and were successfully tested in laboratory.

These CNT & CNF sensors were developed by depositing on SnO₂ thin films by a simple electro-deposition technique. It has been observed that 65% sensitivity of the film could be possible in a bath containing 1% acetonitrile. Sensors based on CNTs showed higher sensitivity than those based on CNF but the surface coverage of the CNF films was significantly larger than CNT films. The response time for these sensors was around 45 seconds.

The sensors developed based on CNTs and CNFs under this project has the unique advantage that these sensors will provide readings of methane gas at room temperature in a real underground coal mine condition. But, the testing of these sensors could not be carried out by Jadavpur University due to various technical problems.

1. **Name of the Project** : **Development of user friendly models for design and operation of jigs and heavy media cyclones for treatment of different coals.**
2. **Date of Start** : Sep 2005
3. **Date completion** : Feb 2009
4. **Implementing Agency** : Advanced Material and Processes Research Institute (formerly known as Regional Research Labr.) Bhopal
5. **Sub-implementing Agency** : Central Mine Planning & Design Institute Ltd., Ranchi
Indian School of Mines University, Dhanbad
6. **Project Leader** : Dr. A. K. Majumder, Scientist
Regional Research Laboratory, Bhopal
Dr. S. Bhattacharyaa,
Indian School of Mines University, Dhanbad
7. **Project Co-ordinator** : Dr. J. P. Barnwal, Scientist
Regional Research Laboratory, Bhopal
8. **Total Approved Cost** : Rs. 61.14 lakh
for AMPRI (RRL) (B) : Rs. 34.22 lakh
for ISM : Rs. 14.22 lakh
for CMPDI : Rs. 12.70 lakh

DESCRIPTION OF THE PROJECT

9. Objective

- (i) To establish the usefulness of the newly developed washability index termed as NGMI.
- (ii) To develop appropriate models correlating washability characteristics of feed coal and process variables in jig and a HMC with their perform areas based on laboratory scale experimental data.
- (iii) Demonstration of the application of the developed models in a coal washery to identify suitable operating conditions for performance optimization of the washing circuit.

10. Work Done

- (i) Review of existing washability quantification methods has been completed.
- (ii) Analysis of existing data base and development of new washability index as well as establishing its usefulness for practical use has been done.

- (iii) A software has been developed to generate the washability curves and the NGMI (Near Gravity Material Index) from the float-sink data of any coal samples.
- (iv) A simple but new methodology has been developed to quickly optimize the performance of a DMC with variation in feed coal characteristics. The advantages associated with this new methodology have been demonstrated in Mohuda coal washery, BCCL.
- (v) Laboratory model centric jig has been procured and installed. Suitable mathematical models have been developed based on the experimental data generated.

11. Findings

The objective of the project was to establish the usefulness of the newly developed washability index termed as Near Gravity Material Index (NGMI) and to develop appropriate models correlating washability characteristics of feed coal and the process variables in a Jig and in a HMC and demonstration of the same.

Mathematical Models have been developed based on the laboratory model HM Cyclones and Jigs.

It has been observed that due to high NGMI content in Indian coals, there is always inefficiency of separation and loss of coal due to misplacement. With the help of the newly developed index of NGMI it was possible to split the total misplacement at particular cut-gravity into two types of misplacements : (i) Misplacement-1 when float is reported to sink and (ii) Misplacement-2 when sink is reported to float. The knowledge of two types of misplacements gives correct information to the washery operator about the corrective measures requires to be taken for minimizing the misplacement for better recovery and the concept was validated at Mohuda washery cyclone.

The newly developed NGMI provides detailed information about the washability characteristics of any coal sample at various densities of separations. The detailed information thus generated may help in making strategic decisions towards optimum utilization of coal resources. Thus usefulness of NGMI has been established.

1. **Name of the Project** : **Development of cheap, energy efficient by-product coke oven for production of hard coke for Steel/ Metallurgical use.**
2. **Date of start** : Oct 2003
3. **Date of completion** : Dec 2008
4. **Implementing Agency** : Central Fuel Research Institute, Dhanbad
5. **Sub-implementing Agency** : Central Mine Planning & Design Institute, Ranchi
6. **Project Leader/Co-ordinator** : Mr. T. K. Mahapatra/Dr. S.K. Hazra,
Central Fuel Research Institute, Dhanbad
7. **Total Approved Cost** : Rs. 286.67 lakh
For CFRI - Rs. 240.60 Lakh
For CMPDI - Rs. 46.07 Lakh

DESCRIPTION OF THE PROJECT

8. Objective

To design and develop a semi-by-product coke oven utilizing the potentials of beehive coke-oven to make it cheap & energy efficient and subsequently to utilize the concept in the development of a demonstration/commercial plant.

9. Work Done

- Sample Collection from different collieries of BCCL and EXL and Sample Preparation.
- Samples were characterized with respect to proximate analysis, swelling index, Roga index and petrographic analysis. These coke samples were tested for Micum Indices, Prosimity, bulk density & proximate analysis.
- Laboratory scale study was done in high temperature oven.
- The prepared was packed in to the retor before inserted in to the oven whose temperature was raised from ambrient to 1000°C @5°C per minute up to 600°C and then @10°C per minute from 600-1000°C. The soaking time at the final temperature would be 30 min after which the furnace is to be shut down, coke pushed into a tray and quenching with water. The coke thus produced is to taken out and sub-sampling of the coke was done for the different tests to get knowledge about its quality.

10. Findings

The objectives of the present investigation were to design and develop a semi-by-product coke oven utilizing the potentials of beehive coke-oven to make it cheap and energy efficient and subsequently to utilize the concept in the development of a demonstration/commercial plant.

Through the operation of the pilot plant, it is concluded that though the objective of the project has generally been achieved with the production of good quality of coke with certain blend of coals, oven design is required to be modified for attaining higher oven temperature for producing better quality of coke based on both the by product and non recovery coke oven principle and possibility of generation of power from waste heatflue gas on commercial scale.

1. **Name of the Project** : **Direct Sourcing of coal for value added chemicals**
2. **Date of start** : Nov 2004
3. **Date of completion** : Apr 2008
4. **Principal Implementing Agency** : CIMFR, Dhanbad and IICT, Hyderabad
5. **Project Leader/Co-ordinator** : Dr. Gora Ghosh, Scientist, CIMFR, Dhanbad
Dr. S. K. Srivastava, Scientist, CIMFR, Dhanbad
6. **Total Approved Cost** : Rs. 70.30 Lakh
For CIMFR - Rs. 32.30 Lakh
For IICT - Rs. 38.00 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

Sourcing coal (directly) for value added chemical, which involves selective catalytic degradation/fragmentation, characterization and ascertain the precursors for value-added chemicals and investigate practicable methods of upgradation of coal derived products for value - added chemical.

8. Work Done

- (i) In addition to Samla coal of ECL, Tirap coal of Assam (NE region) has been collected, Sub-sampled and prepared to -212 micron size sample.
- (ii) Standardization of HPLC instrument was done using UV and RI detectors developed appropriate method for isolation, identification and quantification of various coal derivatives using GPC column and its software was installed successfully for characterization of coal derivatives on the basis of their molecular weight.
- (iii) 20 gms of raw coal under different batches were de-mineralized in an indigenously designed reactor under mechanical stirring at 150°C in presence of optimum amount of alkali. Ash level of Samla coal was reduced to >3% from 14% while that of Tirap coal to 0.9% from 6.1%. The main objective of chemical de-mineralization of coal was to get a clean raw material and generate more surface area for effective oxidative degradation of coal.
- (iv) Proximate and ultimate analysis, functional group content of treated (de-mineralised) and untreated coal were done following is methodology. FTIR spectra of raw and treated coals were recorded for understanding their carbon. Skeleton structure, using spectrum GX perkins Elmer FTIR spectrometer.
- (v) The oxidation of de-mineralised (DM) coals were done in batches (25 gm/batch) using 3N Nitric Acid under reflux condition. It was then dried for 24 hrs. followed by its drying at 110 ±

5°C in air over for due hour. The same method followed for each batch to produce Oxy-Nitrated coal (NOC) which indicated the presence of oxygenated functional groups like Carboxyl (COOH), hydroxy (OH) and Nitro (NO₂). 3N Nitric Acid not only oxidised coal, but also increased the Nitrogen content visa concomital nitration reaction.

- (vi) The NOC was extracted with different organic solvent. There was no significant extract obtained with pet-ether or diethyl ether, whereas a good amount of extracts were obtained with acetone and acetone water mixture. A small amount of extract was also obtained in chloroform. These extracts were subjected to column chromatography using silica gel, followed by seperation using HPLC. The molecules height of acetone - water extract obtained from Samla was determined by RUST's method using compjor as sowent. Spectroscopic analysis using spectrum GX perkins Elmer FTIR spectrometer of chloroform and ether extract of NOC have been carried out.
- (vii) An effort was made to explore the possibility of converting the nitro group in the NOC into NH₂ (AMINO) group which could have been of immense importane in producing organic conductors, tempature sensors and other strategic materials through polymerization. Conventional method failed to reduce NO₂ to NH₂ in NOC. By applying Sodium Dithionite – Ammonia method nitro group was sucessfully converted into Amino group, which was confirmed through FTIR spectroscopic analysis.
- (viii) Polymerization reaction of NOC, by utilizing its hydroxy (-OH) and carboxyl (-COOH) groups, was carried out in presence of formalin and aniline mixture. The product obtained from acid and basic medium were found to be of same nature as of pure polymes of compound rich in aliphatic carboxylic acid have been isolated as observed from FTIR spectra of this product. It has been concluded that the product NOC adduct using aniline formalin did not produce any new product. A new set of polymerization reaction was conducted for the preparation of poly Amine functional coal composite (PAFCC) using dry acetone extract of NOC and pre-distilled aniline. Viscous substance was obtained which was subsequently dried followed by its characterization.
- (ix) A detailed study and characterization of acetone extract as a coal dervative has been found suitable as an additive to prepare conducting polymer membrane. Showed extremely good as a conducting material. The film showed a conductance in the range of 10⁻³ to 10⁻⁴ units which is considered to be a challenging result, hither improvement and to understand the nature and constitution of the product the material has been characterized using 13°C and 1H NMR.

9. Findings

The objective of the project is to derive value added chemicals on coals from different grades of coals of SCCL. The studies under the project were made for understanding the resourcefulness for the Singareni coals for obtaining value added chemicals. The potential chemicals that can be derived from these coals are mainly phenols and aromatics. Even though the coal tar accounts for 10-15% of benzene, toluene and xylene, it can not be a viable source of aromatics, since coal tar yield is hardly 5-10% in carbonization and the major product is coke. In the catalytic degradation of these coals, the maximum yield of the liquid products obtained was about 5% wt and these liquid products contain high value added compounds. The analysis of the product indicated the presence of alkyl naphthalene in small quantities.



Development of Emission Factors for Various Mining Machineries & Operations in Opencast Coal Mines

CMPDI

Funded from Coal S&T grant of Ministry of Coal

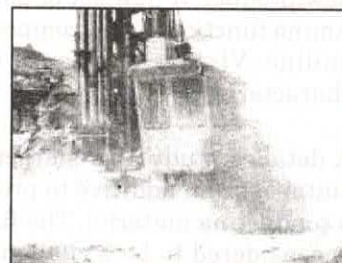
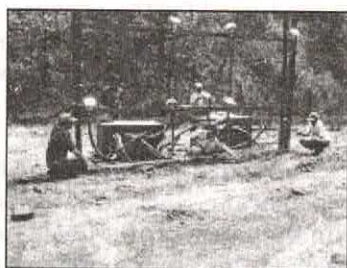
BACKGROUND OF THE PROJECT

The purpose of this study was to develop emission factors for various fugitive dust generating sources for an opencast coal mine in India and to validate the same in a similar mine. The emission factors relate the quantity of dust produced by a particular mining operation to environmental and operational variables. The field work for development of emission factors was mainly carried out at KDH opencast mine of Central Coalfields Limited and the validation was carried out in

- Coal loading and sizing
- Unpaved haul road transportation for coal and overburden

The comparison between the observed and predicted data for SPM and Respirable Particulate Matter (RPM) reveals that :

- 77.5% of the values of the predicted



Rajrappa opencast coalmine of CCL. The convention of shovel-dumper combination is being practised in both mines. The 'Upwind-Downwind Method' has been used for finding out the emission factors from point sources. The validation of the emission factors data was carried out at with the help of Fugitive Dust Model (FDM) of United States Environment Protection Agency (USEPA).

RESEARCH FINDINGS

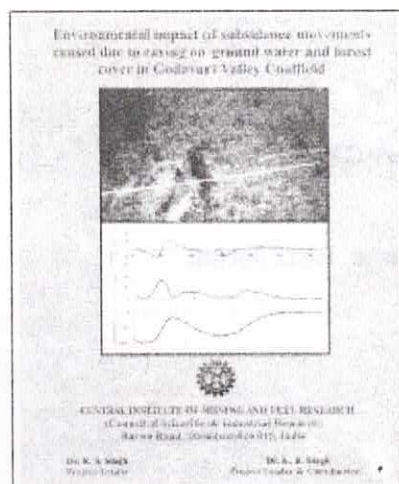
The emission factors for Suspended Particulate Matter (SPM) was developed for surface coal mine using shovel-dumper combination for the following activities :

- Drilling in coal and OB bench
- Overburden loading and unloading

concentrations of SPM were observed within a Factor of Two (FAC2).

- The average of FAC2 and Frictional Bias (FB) value works out to be 0.88 and (+) 0.12 respectively.
- 80% of the values of the predicted concentrations of RPM were observed within a Factor of Two (FAC2)
- The average FAC2 and Fractional Bias (FB) values of RPM works out to be 1.1 and (-) 0.10 respectively.

It can be concluded that the emission factors data developed during this study may be used for predicting the impact of surface coalmines on ambient air quality in similar mining conditions.



Environmental impact of subsidence caused due to caving on ground water and forest cover in Godavari Valley Coalfield - CIMFR

Funded from Coal S&T grant of Ministry of Coal under the guidance of CMPDI Ranchi

BACKGROUND OF THE PROJECT

Subsidence is a time dependent deformation of the sub-surface ground, which is created by re-adjustment of the overburden above voids created by underground mining. Surface manifestation of underground coal extraction occurs in two forms, i.e., pot-hole and trough subsidence. Pot-hole subsidence is an abrupt depression of local ground surface, which occurs due to sudden collapse of the overburden into an underground void. The pot-hole subsidence is very dangerous to lives and properties, as it does not give any prior warning. Trough subsidence is a gentle and large area depression of surface terrain, which is a very common form of subsidence. It is comparatively less dangerous than pot-hole subsidence as it does not occur suddenly.

The results and analyses of data recorded during subsidence investigations and its environmental impact study on ground water and forest cover at 5B and MK-4 Inclines of the SCCL led to some of the following conclusions:

- No Substantial impact on ground water table.
- Almost no impact on forest cover also, rather it has been observed that :
 - * Ground movements have increased soil organic carbon, total nitrogen and phosphorus by 9.14 - 41.9%, 0.15-4.5% and 2.5-5.8% respectively, in subsided sites with respect to undisturbed sites.
 - * Subsidence movements also enhanced 1.61-1.71 fold fine root biomass in subsided sites in comparison to controlled site due to greater proliferation of roots following high moisture and accumulation of organic carbon contents due to run-off from adjacent undisturbed site.
 - * Subsidence movements have no impact on phytosociological characters of forest cover over all the subsided sites having up to 1 m wide cracks and 23.74 mm/m tensile strain. Although, a few plants got tilted falling within cracked zone of ground movements.

1. **Name of the Project** : **Environmental Cleanup and remediation of coal mining overburden sites of TIRAP Collieries, Assam.**
2. **Date of start** : Nov 2005
3. **Date of completion** : Oct 2008
4. **Implementing Agency** : Regional Research Laboratory (CSIR)
Jorhat, Assam
5. **Project Leader/Co-Ordinator** : Dr. H. P. Deka Boruah, Scientist, RRL, Jorhat
6. **Total Approved Cost** : Rs. 18.90 Lakh

DESCRIPTION OF THE PROJECT

7. Objectives

- In situ assessment of the environmental degradation due to opencast coal mining.
- Monitoring of Soil degradation due to acid mine drainage (AMD), by siltation or by dumping of over burden materials.
- Assessment of the microbial population size in and around coal mining areas and possible remedial measures to restore the microbial community.
- Assessment of phytotoxicity of coal mining pollutants and assessment of accumulation pattern of different trace and heavy metal content, detoxification of coal mine pollutants phytotoxicity both by chemical and biological means.
- Development of agro-forestry, assessment of growth pattern of the plants and biochemical and physiological characterization of the plants grown in coal mine pollutants ravaged areas.
- Management of organic matter and development of green cover.

8. Work Done

- Tirap Colliery OB dump site overlooking to NH37 has been selected for in-situ remediation study of the Project. It was observed that total microbial population size enumerated in coal mine OB and of the OB enzymatic activities were below the threshold limit.
- Plant samples which were able to grow on mine OB have been screened under control conditions.
- Evaluation of enzymatic activities of OB experimental site was done.

- Rate of germination, morphological changes of root, physiological and biochemical characters of plant DHAINCHA had been studied under controlled condition.
- Activities of enzyme were assessed and found 7 to 8 fold less. Biomass for the plant grown in mine OB were 7 to 10 times less compared to un-mined soil. Evaluation of enzymatic activities of OB experimental site has been done.
- Mine OB transformation in soil promotion and soil DNA of the experimental bed determined and weathering of mine OB was faster in remediate site. Simultaneously a higher level of DNA was recorded in remediate site.

9. Findings

The project objective was to assess the soil degradation due to opencast coal mining and possible remedial measures to restore the microbial community.

The project investigation leads to develop eco-restoration strategy for remediation of high sulphur containing coal mine degraded land, mine OB dumping site and also abandoned mine sites.

The protocol developed could be suitable to implement for re-cloth of mine OB denuded land or any other coal mine degraded land within short span of time.