

**S&T**  
**Annual Report**

**वार्षिक प्रतिवेदन**  
**2014-15**

**Government of India**  
**Ministry of Coal**  
**New Delhi 110 001**

**Central Mine Planning & Design Institute Limited**

A Miniratna Company

(A Subsidiary Company of Coal India Limited)

Gondwana Place, Kanke Road, Ranchi 834 031

## प्राक्कथन

कोयला उद्योग के सम्पूर्ण विकास के लिये संगठित अनुसंधान 1975 में सरकार का योजनाबद्ध कार्यक्रम "कोयला विज्ञान एवं प्रौद्योगिकी योजना" के 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 को सक्षम बनाया है।

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

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

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


1975 से कोयला एवं लिग्नाइट उत्पादक कम्पनियों की सक्रिय सहभागिता के साथ कोयला एवं सम्बद्ध उद्योगों से सम्बन्धित राष्ट्रीय अनुसंधान एवं शैक्षणिक संस्थाओं द्वारा कोयला मंत्रालय के विज्ञान एवं प्रौद्योगिकी अनुदान के तहत वर्तमान में अनुसंधान परियोजनाएँ क्रियावित की जा रही हैं। इसके परिणामस्वरूप अभी तक 247 करोड़ रुपये की अनुमानित लागत से 313 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 12 चालू परियोजनाएँ एवं 03 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 में संस्करण को समृद्ध बनाने के लिये प्रस्तुति एवं विषयवस्तु के प्रकाशन में सुधार लाने हेतु आपके महत्वपूर्ण सुझावों का स्वागत है।

स्थान: राँची

  
(ए. के. देबनाथ)  
अध्यक्ष-प्रबंध निदेशक  
सी.एम.पी.डी.आई

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## LIST OF COAL S&T PROJECTS COMPLETED DURING 2014-15

Sl. No.	Name of Project	Code No.	Impl. Agency	Page No.
1.	Development of Self Advancing (mobile) Goaf Edge Supports (SAGES) for depillaring operations in underground coal mines	MT (EoI)/159	ISM, Dhanbad & M/s Jaya Bharat Equipment Pvt. Ltd. (JBEPL), Hyderabad	23 - 24
2.	Development of software for prediction of subsidence by 3D numerical modeling for SCCL mines	MT/160	Anna University, Chennai & SCCL	25 - 26
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*Production, Productivity & Safety*

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

## DESCRIPTION OF THE PROJECT

### 9. Objectives :

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

### 10. Status as on 31.03.2015:

Literature survey and basic data collection from mine completed. Concept has been developed for the wireless technology. Modules for vibrating wire sensors were developed. After analysis of detailed system, 3D CAD models and architecture design of the proposed robot has been finalized. After successful design, the modules for vibrating wire sensor and wireless nodes has been developed. Front and rear arm, C-bracket, shafts of the proposed model of the robot were already been developed by CMERI, Durgapur.

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

## DESCRIPTION OF THE PROJECT

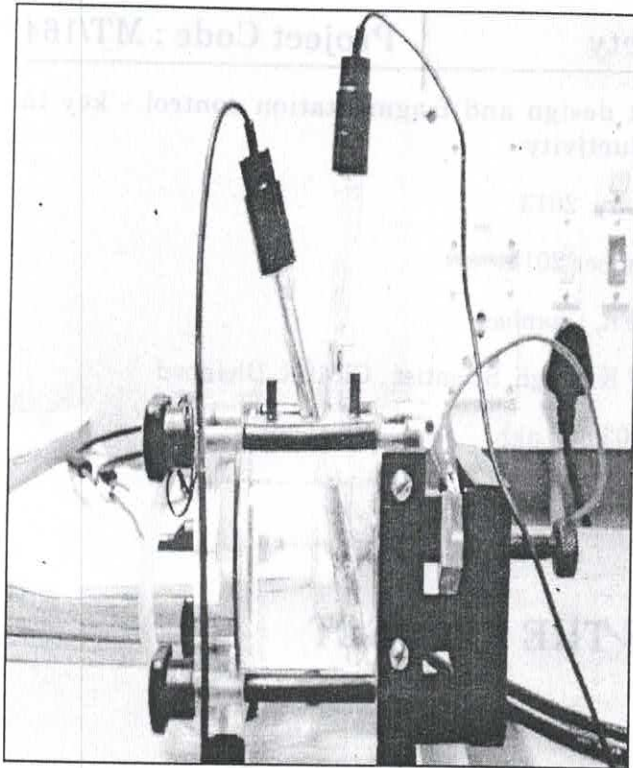
### 8. Objectives :

#### NLC

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

#### NITT

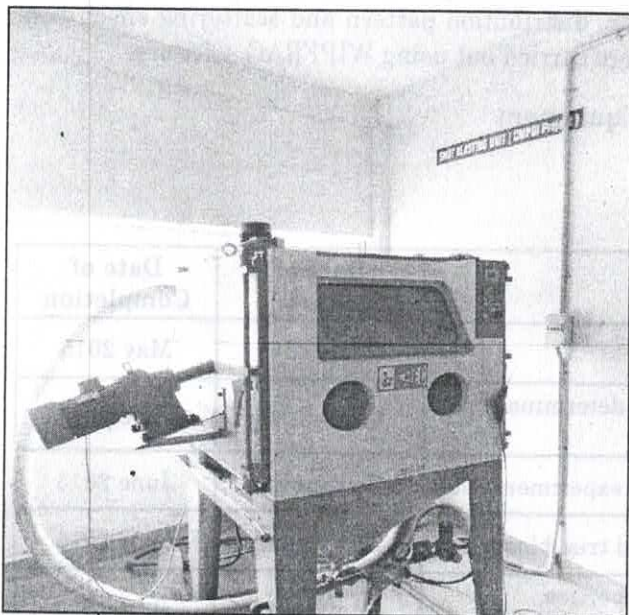
- (i) To develop suitable erosion and corrosion resistant metallic & non metallic coating/substrates on carbon steel pipes for minimum erosion-corrosion.



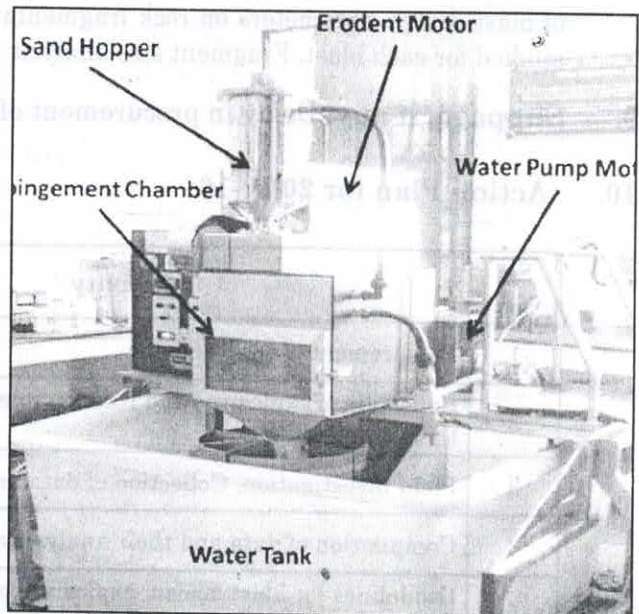
High Energy Planetary Ball Mill — MT/163



Corrosion Test Equipment — MT/163



Shot Blasting Unit — MT/163



Waterjet Erosion Tester — MT/163



1.	Name of the Project	:	Assessment of horizontal stress fields in deeper horizons and development of roof hazards maps of coal resources in SCCL
2.	Date of Start	:	March 2015
3.	Scheduled date of Completion	:	March 2018
4.	Implementing Agency(s)	:	(i) SCCL, Kothagudem (ii) NIRM, Kolar
5.	Project Co-ordinators	:	(i) Sri A. Manohara Rao, Director (P&P), SCCL (ii) Dr. V Venkateswarlu, Director, NIRM
6.	Project leaders	:	(i) Dr. D.N. Sharma, GM(Exploration), SCCL (ii) Dr. D. S. Subrahmanyam, Scientist & Head, NIRM
7.	Total Approved Cost	:	Rs. 358.40 lakh For NIRM - Rs. 340.05 lakh For SCCL- Rs. 18.35 lakh

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

To assess the horizontal stress field in deeper horizon in the mines of Godavari coalfield, vis-à-vis roof hazard map, and devise suitable support systems for the coal mining blocks of SCCL.

Hydraulic fracturing technique will be used to measure the state of in-situ stress underground through a borehole. The test provides, in general the magnitudes and directions of the principal horizontal stresses. Roof hazard zonation will be carried out to identify potential weak zones in the mines. Integrating the two, a suitable methodology will be developed for devising the support systems or for change in direction of the workings for safer and productive mine workings.

After establishing the stress field and preparation of suitable support design in SCCL, guidelines will be prepared so that these investigations will be useful for the other coalfields of India for the support design

1.	Name of the Project	:	Shale Gas Potentiality Evaluation of Damodar Basin of India
2.	Date of Start	:	December 2012
3.	Scheduled date of Completion	:	November 2015
4.	Implementing Agency	:	NGRI ,Hyderabad
5.	Sub-Implementing Agency	:	CIMFR, Dhanbad & CMPDI, Ranchi
6.	Project leader /Co-ordinator	:	Shri D. J Patil , NGRI Dr. V. A. Mendhe, Scientist, CIMFR, Dy. GM (CBM), CMPDI
7.	Total Approved Cost	:	Rs1686.84 lakh For NGRI:Rs. 462.59 lakh For CIMFR: Rs. 169.95 lakh For CMPDI: Rs. 1054.30 lakh

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

To evaluate Damodar basin of India for its shale gas potentiality through integrated geophysical, geological, geo-chemical and petrophysical investigations.

### 9. Status as on 31.03.2015:

Shale samples from Dharma block of Raniganj and West Mahuda, Singra, Kapuria of Jharia coalfields and Bokaro coalfields were collected by CIMFR for petrographic, TOC and Rock eval pyrolysis tests at CMPDI & NGRI, Hyderabad. Proximate analysis was carried out for 60 shale core samples and adsorption isotherm of 20 shale core samples was conducted by CIMFR, Dhanbad. Investigated megascopic properties of 60 shale samples and carried our proximate analysis. Adsorption isotherm for 20 shale samples and SEM analysis of 22 shale samples were conducted. FTIR analysis of about 20 shale samples were also conducted. Geo-chemical analysis of shale samples for Rock eval pyrolysis tests is under progress at NGRI, Hyderabad. Rangamati B Block at Raniganj coalfields and western Jharia coalfields has been selected as suitable site for conducting 3D seismic survey. The vibrator, which is a major equipment in the project was procured by NGRI, Hyderabad. Procurement of the other equipment is under progress.

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

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

The objectives of the project are:

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

# *Coal Beneficiation & Utilisation*

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1.	Name of the Project	:	Development of indigenous catalyst through Pilot Scale Studies of Coal-To-Liquid (CTL) conversion technology
2.	Date of Start	:	January 2010
3.	Scheduled date of completion	:	August 2015
4.	Implementing Agency	:	CIMFR, Dhanbad
5.	Sub-Implementing Agency	:	CMPDI, Ranchi
6.	Project Leader	:	Dr. Sudip Maity, Scientist, CIMFR
	Project Co-ordinator	:	Dr. Amalendu Sinha, Director, CIMFR
7.	Total Approved Cost	:	Rs. 805.40 lakh
			For CIMFR: Rs. 688.50 lakh
			For CMPDI: Rs. 116.90 lakh

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

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

- |    |                              |   |   |
|----|------------------------------|---|---|
| 1. | Name of the Project          | : | Design and Development of truck mounted mobile coal sampler for instant coal ash & moisture analyzer at site from railway wagon/truck |
| 2. | Date of Start                | : | August 2011   |
| 3. | Scheduled date of Completion | : | December 2015   |
| 4. | Implementing Agency          | : | CIMFR, Dhanbad  |
| 5. | Sub-Implementing agency      | : | (i) M/s Pranay Enterprises, Hyderabad<br>(ii) SCCL, Kothagudem  |
| 6. | Project leader /Co-ordinator | : | (i) Dr. S . K. Kashyap, Scientist, CIMFR<br>(ii) Shri A. V. L. Narasimha Rao, M/s Pranay Enterprises, Hyderabad                       |
| 7. | Total Approved Cost          | : | Rs. 167.60 lakh<br>Phase -I Rs. 41.09 lakh<br>Phase -II Rs. 126.51 lakh   |

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

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

### 9. Status as on 31.03.2015:

Phase - I study completed and project completion report of Phase -I study submitted. Under this project it was establish the feasibility of nuclear technique method with dual gamma-ray transmission for analysis of coal for ash and moisture content. Proto type of Mobile coal sampler has been developed. Fabrication of full scale truck mounted coal sampler is in progress.

1.	Name of the Project	:	Development of an On-line Coal Washability Analyser
2.	Date of Start	:	March 2014
3.	Scheduled date of Completion	:	March 2016
4.	Implementing Agency	:	CIMFR, Dhanbad
5.	Sub-Implementing agency	:	M/s Ardee Hitech Pvt. Ltd., Visakhapatnam
6.	Project leader /Co-ordinator	:	(i) Mr. K.M.P. Singh, CIMFR, Dhabad (ii) Dr. S. A. Khayyom, M/s Ardee Hi-tech Pvt. Ltd., Vishakhapatanam/ (iii) Mr. T. Gouri Charan , CIMFR, Dhanbad
7.	Total Approved Cost	:	Rs. 849.00 lakh For CIMFR- Rs. 505.80 lakh For Ardee Hitech- Rs. 343.20 lakh

## DESCRIPTION OF THE PROJECT

### 8. Objectives :

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

The second phase the system may be upgrade for online operations

### 9. Status as on 31.03.2015:

On- line coal washability analyzer is being developed for which extensive literature survey was

*Environment & Ecology*

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

## DESCRIPTION OF THE PROJECT

### 7. Objectives:

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

### 8. Status as on 31.03.2015:

Fields studies were completed in three phases at PK OC-II project and Manuguru, SCCL. Analysis of collected data is under progress. Dust dispersion models developed for loading, OB dumping and CHP operations. Samleswari OCP of IB valley area and Bhubneswari OCP of Jagannath area at MCL have been provided for validation of the developed model.

### 9. Slippage, if any: Delay in procurement of equipment

### 10. Action Plan for 2015 -16:

Sl. No.	Activity	Date of Start	Date of Completion
1	Analysis of results	Continuing	Apr 2015
2	Report preparation	Continuing	Jul 2015

conducting research in the coal sector through their involvement in the project activities for bringing in social and environmental up gradation in the mining areas.

**9. Status as on 31.03.2015:**

Newly started project.

**10. Slippage, if any: N. A.**

**11. Action Plan for 2015 -16:**

Sl. No.	Activity	Date of Start	Date of Completion
1	Site selection	May 2015	May 2015
2	Conceptualization of MLSA framework	Apr 2015	May 2015
3	Purchase of software	Apr 2015	May 2015
4	Data Analysis	May 2015	June 2015
5	MLSA results presentation	Aug 2015	Sep 2015
6	Arrangement of resources at site	June 2015	Jul 2015
7	Preparation of saplings at nursery	May 2015	June 2015
8	Installation of drip irrigation system at site	May 2015	June 2015
9	Plantation on 5 acres land	June 2015	May 2016
10	Socio-economic needs and capabilities assessment	May 2015	June 2015
11	Liaison with forest dept. and other govt. agencies	Apr 2015	Mar 2016
12	Community mobilization formation of SHGs	Jul 2015	Sep 2015
13	Launch of vocational training programme	Oct 2015	Oct 2015
14	Annual assessment and reporting of livelihood programme outputs and outcomes	Jan 2016	Mar 2016

*S&T Completed Projects during 2014-15*

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1. **Name of the Project** : Development of Self Advancing (mobile) Goaf Edge Supports(SAGES) for depillaring operations in underground coal mines- [MT(EoI)/159]
2. **Date of Start** : Sep 2010
3. **Scheduled date of completion** : May 2014
4. **Implementing Agency** : ISM, Dhanbad
5. **Sub-implementing Agency** : M/sJayaBharatEquipmentPvt.Ltd(JBEPL),Hyderabad
6. **Project Leader** : Prof.(Dr.) U. K. Singh, ISM, Dhanbad
7. **Total Approved Cost** : Rs. 197.75 lakh  
For ISM - 62.10 lakh  
For JBEPL - 135.65 lakh
8. **Total Expenditure** : Rs. 176.78 lakh  
For ISM - Rs. 45.44 lakh  
For JBEPL - Rs. 131.34 lakh

## DESCRIPTION OF THE PROJECT

### 9. Objectives:

Design and develop Self Advancing Goaf Edge Support (SAGES) of Medium Duty: 2 x 200T load capacities for depillaring operations in underground coal mines.

### 10. Work Done:

- ✦ Design and fabrication of one 200T SAGES and a testing rig FEM analysis
- ✦ Testing of the support at JBEPL, Hyderabad
- ✦ On the basis of the test result, modification in design and fabrications of 5 nos of SAGES.
- ✦ Transportation and installation of supports in mines
- ✦ Field trial of the 5 nos. of SAGES
- ✦ Final design of the SAGES for commercial production
- ✦ Development of testing guidelines for testing of SAGES

### 11. Findings:

Under this project, six nos. of Self Advancing (Mobile) Goaf Edge Supports (SAGES) have been developed so as to avoid the labour intensive and time consuming process in erecting wooden chocks and props at goaf edges for protection of roof during depillaring operations. These self-propelled

1. Name of the Project : Development of software for prediction of subsidence by 3D numerical modeling for SCCL mines - MT/160
2. Date of Start : August 2011
3. Scheduled date of completion : July 2014
4. Implementing Agency : Anna University, Chennai
5. Sub-implementing Agency : SCCL, Kothagudem
6. Project Leader : Prof. (Dr.) L. Ajay Kumar, Anna University, Chennai
7. Total Approved Cost : Rs. 79.48 lakh  
(S&T Grant- Rs. 45.73 lakh &  
Cont. SCCL- Rs. 8.07 lakh)

## **DESCRIPTION OF THE PROJECT**

### **8. Objectives:**

- To develop a subsidence prediction model and thereafter a handbook for the engineers and surveyors of SCCL, who are concerned with subsidence engineering. This book would aid in predicting subsidence and its associated phenomena of slope, strain and surface damage at any given site with speed and accuracy.
- To decide the size and shape of protective pillars to safeguard against damage to surface structures. Also to develop the concept of "non-effective width" for planning extraction below ground without any effects of subsidence on surface. This would facilitate carrying out mining extraction below rivers, nallahs, tanks, railway lines, townships and other protected structures.
- To develop a reliable and easy to use software package for the determination of above mentioned subsidence parameters based on preliminary survey data of drill-log and plan layout information for new or future mines.
- To develop a user interface software for prediction of subsidence parameters by 3D numerical modeling technique.
- Training of SCCL personnel for using the developed software.

1. Name of the Project : Development of customized organic coatings for corrosion protection of special mining equipment at Neyveli Lignite mines - MT/161
2. Date of Start : August 2011
3. Scheduled date of completion : January 2015
4. Implementing Agency : NLC, Neyveli
5. Sub-implementing Agency : Central Electro-Chemical Research Institute (CECRI), Karaikudi, Tamilnadu
6. Project Leader : (a) Dr. S. Muthukrishnan Scientist, CECRI  
(b) Mr. P. Veerabalu CM(Mech.), NLC
7. Total Approved Cost : \*Rs. 79.48 lakh  
For NLC – Rs. 46.41 lakh  
For CECRI - Rs.33.07 lakh

## DESCRIPTION OF THE PROJECT

### 8. Objectives:

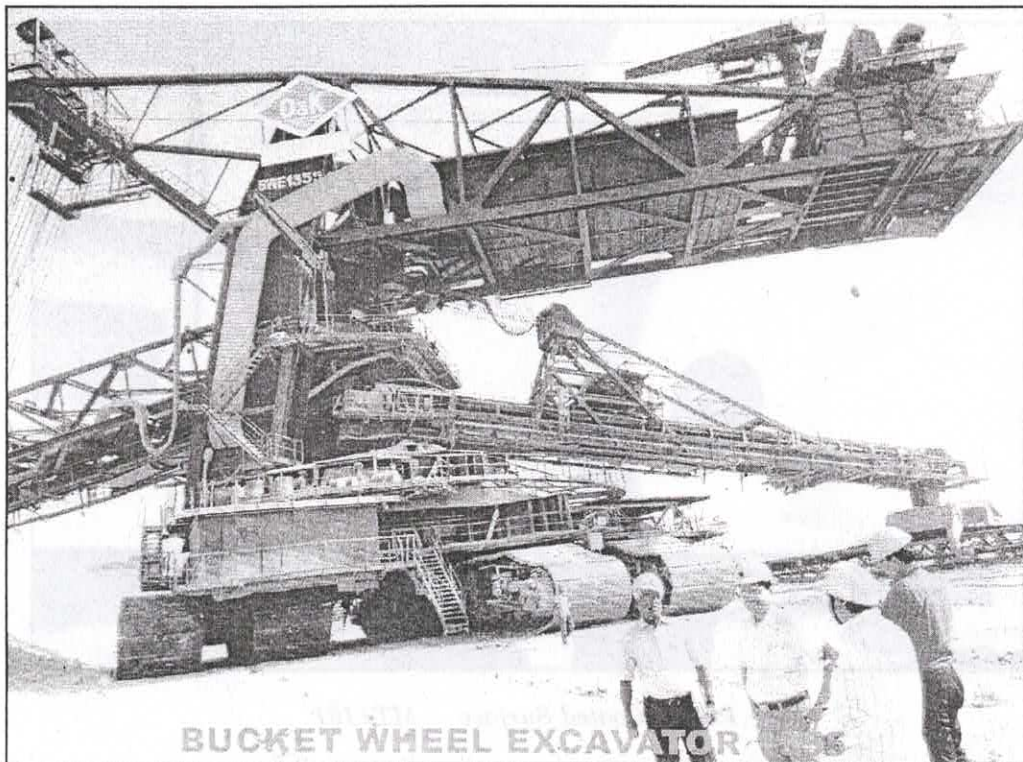
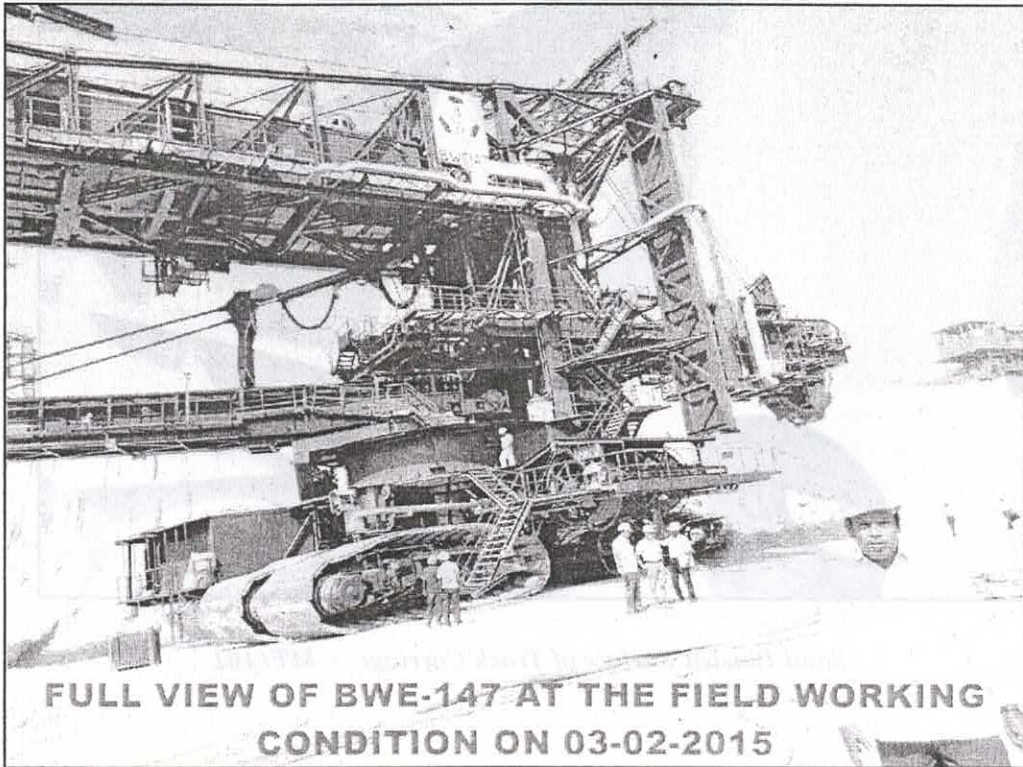
#### NLC

- ❖ To assess corrosive environment and the Corrosion process mechanisms.
- ❖ To develop appropriate erosion-corrosion models
- ❖ To evolve suitable coating materials for critical SME Components with proper methodology
- ❖ Evaluation of the corrosion coatings.

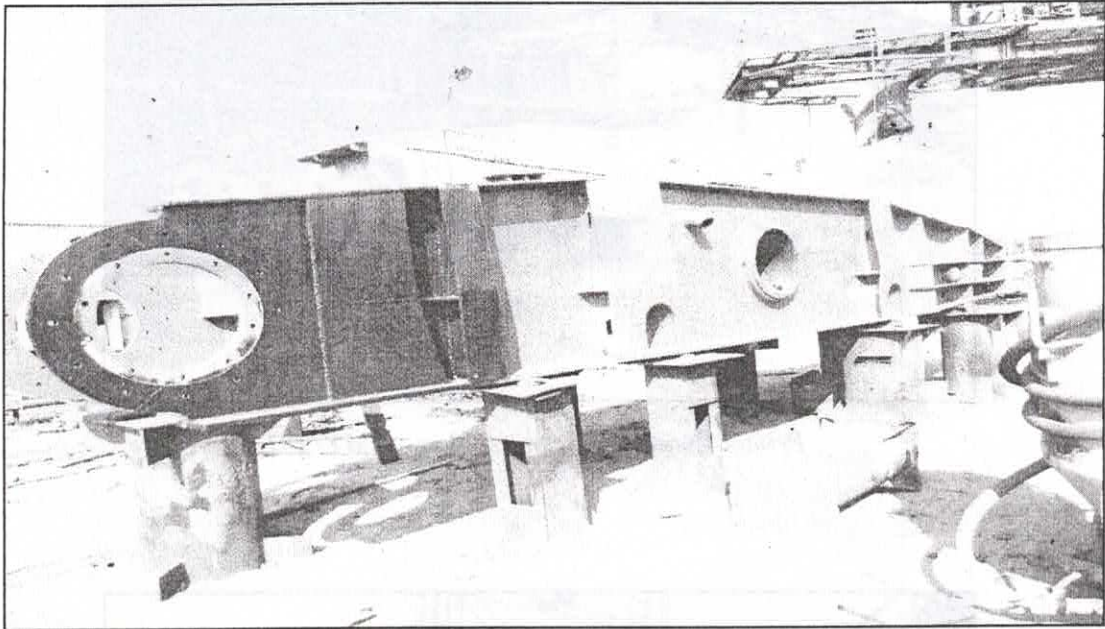
#### CECRI

- ❖ To develop an organic nano –coating for corrosion prevention in the areas of mines based on the findings in the preliminary studies
- ❖ To apply and evaluate the performance and redesign the coating composites to enhance the life of the components

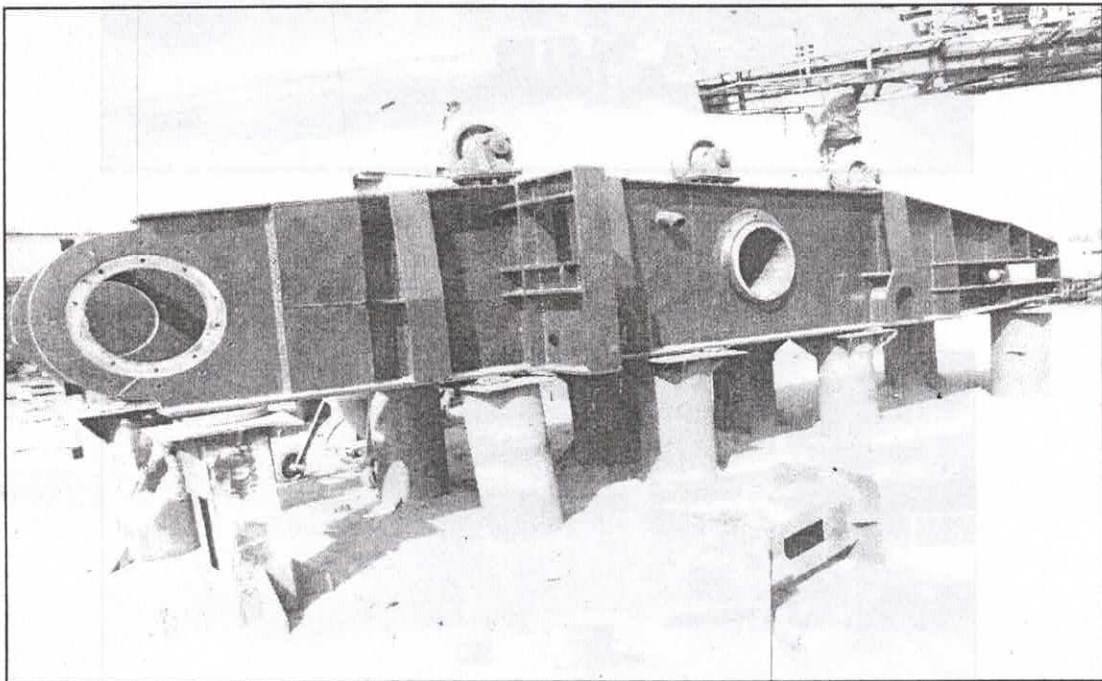
Inspection by CMPDI, CECRI & NLC Officials  
on Completion of the Project (MT/161) at NLC Mines



1885 FST - Invert



*Top and Under Coated Surface — MT/161*



*Completed Top Coated Surface — MT/161*