CHAPTER 8

RESEARCH & DEVELOPMENT

ANNUAL REPORT 2018-19

RESEARCH & DEVELOPMENT

Research Projects Under S&T Grant of Ministry of Coal

The R&D activities in Coal sector are administered through an apex body namely, **Standing Scientific Research Committee (SSRC)** with Secretary (Coal) as its Chairman. The other members of this apex body include Chairman CIL, CMDs of CMPDI, SCCL and NLCIL, Director General (DG) of Directorate General of Mines Safety (DGMS), Directors of concerned CSIR Laboratories, Representatives from Department of S&T (DST), NITI Aayog and Educational Institutions, etc. The main functions of SSRC are to plan, programme, budget and oversee the implementation of research projects. The SSRC is assisted by a Technical Sub-Committee headed by CMD, CMPDI.

The R&D projects are covered under 4 thematic areas viz. improvement in production, productivity & safety in coal mines, coal beneficiation, coal utilization and protection of environment & ecology.

CMPDI acts as the Nodal Agency for co-ordination of research activities in the coal sector, which involves identification of 'Thrust Areas' for research activities, identification of agencies which can take up the research work in the identified fields, processing the proposals for Government approval, preparation of budget estimates, disbursement of fund, monitoring the progress of implementation of the projects, etc.

A total of 395 S&T projects were taken up (till 31.03.2019) and 325 S&T projects were completed (till 31.03.2019).

PHYSICAL PERFORMANCE

The status of Coal S&T projects during 2018-19 is as under:

Sl. No.	Parameters	Quantity
1	Projects on-going as on 01.04.2018	17
2	Projects completed during 2018-19	5
3	Projects on-going as on 01.04.2019	12 + 1@ (@ Sanction letter awaited from MoC)
4	Projects approved by SSRC during 2018-19	01* (* 1 project has been approved by the SSRC)

Research projects under CIL R&D

For in-house R&D work of CIL, an R&D Board headed by Chairman, CIL is also functioning. CMPDI acts as the Nodal Agency for processing the proposals for CIL approval, preparation of budget estimates, disbursement of fund, monitoring the progress of implementation of the projects, etc.

In order to enhance R&D base in command areas of CIL, the CIL Board in its meeting held on 24th March 2008 had delegated substantial powers to CIL R&D Board and the Apex Committee of the R&D Board. The Apex Committee is empowered to sanction individual R&D project up to ₹ 5.0 Crore value with a limit of ₹ 25.0 Crore per annum considering all the projects together, whereas CIL R&D Board is empowered to sanction individual R&D project up to ₹ 50.0 Crore.

So far, 90 CIL R&D projects have been taken up (till 31.03.2019), out of which 61 projects have been completed (till 31.03.2019).

PHYSICAL PERFORMANCE

The status of CIL R&D Projects during 2018-19 is as follows:

Sl. No.	Parameters	Quantity
1	Projects on-going as on 01.04.2018	21
2	Projects sanctioned during 2018-19	04
3	Projects completed during 2018-19	Nil
4	Projects on-going as on 01.04.2019	25

FINANCIAL STATUS

Budget provisions vis-à-vis actual fund disbursement during the period are given below:

(₹ in Crores)

2017-18		2018-19	
RE	Actual	RE	Actual
75.00	59.24	30.00 (yet to be approved)	13.57 (Unaudited)

Coal S&T project completed during 2018-19:

1. Techno-economic evaluation and performance behaviour of Self Advancing (mobile) Goaf Edge Supports (SAGES) (Phase - II)

This project was executed by IIT-ISM, Dhanbad in association with M/s Jaya Bharat Equipment Pvt. Ltd (JBEPL), Hyderabad.

Under this project, 6 nos. of developed SAGES (developed in Phase-I) after making necessary modifications were subjected to field trial at RK-7 underground mine of SRP Area, SCCL, where the immediate roof is shale/sandstone to study the performance behavior and its influence on the ground movement and also to study the techno-economic feasibility. Field trial successfully completed by deploying the SAGES in the depillaring panel of RK-7 Mine of SCCL.

The Development of SAGES for safe, economically and efficient extraction of locked coal in pillars in underground coal mines paves the path of make in India mission for manufacturing of equipment for mechanized underground coal mines in India.

2. Assessment of mine water environment and development of suitable and cost effective mine void aqua eco-system for promoting Fish culture in abandoned coal quarries of CIL

This project was executed by Birsa Agricultural University (BAU), Ranchi in association with CMPDI, Ranchi.

The above study was conducted at Sangam OCP and Saunda AK of CCL. An aquatic plant called "Hydrilla" was planted on the periphery of the water bodies to boost up the Dissolved Oxygen (DO) concentration in the water upto a depth of 30 meter. The other aquatic plants Azolla, Salvinia and Spirodella alone and in groups has shown promises in reducing the Total Dissolved Solids (TDS). Cages has been inserted in the water and stocked fishes have shown significant growth.

Ultimately, a cost effective aqua eco-system has been developed for promoting pisciculture in post-mining voids and abandoned coal quarries of Coal India Limited, to improve the water quality through biological method for suitability of pisciculture, selection of suitable fish species and pisciculture techniques. Also, a suitable and cost effective guideline has been developed for further use of coal quarries for income generation through pisciculture.

3. Assessment of horizontal stress fields in deeper horizons and development of roof hazards maps of coal resources in SCCL

This project was executed by Singareni Collieries Company Limited (SCCL), Kothagudem in association with National Institute of Rock Mechanics (NIRM), Bengaluru.

Geo-technical mapping and lineaments analysis was done to derive the stress orientation and distribution in the coal bearing formation of Godavari valley of SCCL and was validated by drilling two boreholes (with hydro-fracturing) for in-situ stress measurement at Mandamarri Shaft block B&C / Rabindra Khani New Technology (RKNT) dip side block.

Under this project, horizontal stress fields have been assessed in deeper horizon in the mines of Godavari coalfield and suitable support systems have been devised for the coal mining blocks of SCCL. Also, a guideline was prepared for replication into other coalfields of India for suitable support design.

4. Possible implications of Bioavailable Iron (BAI) in coal mine dust on coal workers' lung disease

This project was executed by National Institute of Miners' Health (NIMH), Nagpur in association with Priyadarshini Institute of Engineering & Technology (PIET), Nagpur, Central India Institute of Medical Science (CIIMS), Nagpur & Western Coalfields Ltd. (WCL), Nagpur.

Under this study, 77 coal dust samples were collected from selected mines (Saoner, Sillewara, Adasa, Umrer, Chandrapur, Ballarpur, Manjri, Wani and Wani North area) of Maharastra and (Pench, Patharkheda and Kanhan area) Madhya Pradesh region for detailed analysis.

Based on the in-vitro and in-vivo study, it has been found that Bioavailable Iron (BAI) has an adverse health impact. Early detection of BAI can reduce the occupational health problems associated with exposure to coal mine dust.

A detailed profiling and characterization of bioavailable iron in the coal samples and in respirable coal dust particles of various coal mining regions of Central India has been studied to develop in vitro model using human lung cell line and in vivo model using animal for pneumoconiosis disease by exposing different dose time interval of bioavailable iron coal dust or respirable coal dust particle. The study also stressed on the toxicity profile of respirable coal dust and bioavailable iron present in coal dust by measuring oxidative stress, cytotoxicity, genotoxicity and immunotoxicity parameters by using developed in vitro and in vivo models.

5. Design of water network to optimize water consumption in coal washeries for removal of impurities from coal

This project was executed by IIT, Roorkee in association with CMPDI, Ranchi and CCL, Ranchi.

Under this project, process flow sheet of Kedla and Piparwar washary of CCL was studied for calculating the minimum fresh water requirement and to predict the minimum waste water generation using the technique of 3Rs (Reuse-Regeneration-Recycle) based on water Pinge algorithm. Ultimately, an optimum water network was suggested so that washeries water network would be modified for closed water circuit operation with zero discharge of effluent to the surrounding.

Financial status

Budget provisions vis-à-vis actual fund disbursement during the period are given below:

(₹ in Crores)

2017-18			2018-19			
RE	Fund received from MoC	Actual	BE	RE	Fund received from MoC	Actual
10.00	8.80	11.50*	10.00	25.00	24.19	24.23* (Unaudited)

* Utilising unspent fund of the previous year