



RESEARCH & DEVELOPMENT

ANNUAL REPORT 2019-20

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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 5 thematic areas viz. improvement in production, productivity & safety in coal mines,

coal beneficiation, coal utilization, protection of environment & ecology and clean coal technology.

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 392 S&T projects have been taken up till 31.12.2019 and 322 S&T projects have been completed till 31.12.2019.

PHYSICAL PERFORMANCE

The status of Coal S&T projects during 2019-20 is as under:

| Sl. No. | Parameters | Quantity |
|---------|--|--|
| 1 | Projects on-going as on 01.04.2019 | 13 |
| 2 | Projects completed during 2019-20 | 1+3* (* Expected to be completed by March, 2020) |
| 3 | Projects on-going as on 01.04.2020 | 13 (Considering expected approval of 4 projects & completion of 4 projects) |
| 4 | Projects approved by SSRC during 2019-20 | 4* (* Expected to be approved by March, 2020) |

Financial status

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

(in ₹ Crores)

| 2018-19 | | | 2019-20 | | | |
|---------|------------------------|--------|---------|-------------------------------|---|---------------------------|
| RE | Fund received from MoC | Actual | BE | RE | Fund received from MoC | Actual |
| 25.00 | 24.19 | 24.22 | 25.00 | 30.00 (Yet to be approved) | 18.78 (₹9.44 crore received on 30.12.19) | 9.40 (Till 31.12.2019) |

Status of 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, 92CIL R&D projects have been taken up till 31.12.2019, out of which 62 projects have been completed till 31.12.2019.

PHYSICAL PERFORMANCE

The status of CIL R&D Projects during 2019-20 is as follows:

| Sl. No. | Parameters | Quantity |
|---------|--|---|
| 1 | Projects on-going as on 01.04.2019 | 21 |
| 2 | Projects sanctioned during 2019-20 (upto 31.12.2019) | 2 |
| 3 | Projects completed during 2019-20 | 4 + 1* (* Expected to be completed by March, 2020) |
| 4 | Projects on-going as on 01.04.2020 | 18 (Considering Completion of 1 project) |

FINANCIAL STATUS

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

(₹ in Crores)

| 2018-19 | | 2019-20 | |
|---------|--------|---------|----------------------------|
| RE | Actual | RE | Actual |
| 30.00 | 13.57 | 30.00 | 10.66 (Till 31.12.2019) |

Following CIL R&D project have been completed during 2019-20 till 31.12.2019. Their project completion report is to be accepted by R&D Board of CIL.

1. Assessment of applicability and performance of Ground based Interferometry Synthetic Aperture Radar (GblnSAR) in safety zoning of surface mining slopes Implementing agencies: IIT, Kharagpur and ECL, Sanctoria
2. Seismic data processing, interpretation and identification of thin coal seams using Inverse Continuous Wavelet Transform Deconvolution (ICWT-Decon) for resource estimation.
Implementing agencies: Gujarat Energy Research and Management Institute (GERMI), Gandhi Nagar and CMPDI, Ranchi
3. Dry Beneficiation of High Ash Indian Thermal Coal.
Implementing agency(s): National Metallurgical Laboratory (NML), Jamshedpur, CMPDI, Ranchi and MCL, Sambalpur
4. An integrated geo-physical approach for tectonic study in main coal basin of Singrauli Coalfields (CF) using 3-D inverse modelling of Gravity, Magnetic and AMT data.
Implementing agency(s): IIT-ISM, Dhanbad and CMPDI, Ranchi.

Research & Development in SCCL:

Various scientific institutions such as CIMFR, NIRM, CSIRO-Australia, IIT (BHU), IIT (ISM), IITK, NITK, and other reputed scientific institutions are involved to introduce the various modern and advanced mining technologies in SCCL to improve safety and productivity in coal mining operations.

The following various scientific studies are being conducted by the reputed scientific agencies:

- Design & monitoring for development and extraction of panels by various underground technologies, support design, design of opencast benches & dumps, monitoring of underground environment and prevention of spontaneous heating.
- As on now, 44 scientific studies are on hand in different UG mines and OC Projects by various scientific institutions at a cost of approximately ₹ 5.30 Crores.

Under Coal S&T and DST project, following R&D studies are in progress:

- Design and Stability of pillars/Arrays of pillar for different Mining methods in coal mine workings. Models for simulation of pillar behaviour are in progress (approximate cost of the project is ₹ 562 lakhs).
- Hybrid Presrix process for simultaneous remediation of acid mine drainage (AMD) and recovery of Individual metal sulphides (approximate cost of the project is ₹ 74 lakhs).
- Microbial recovery of biogenic methane from coal washery rejects with CO₂ sequestration using novel hybrid geo-photo bioreactor and reclamation of the site (DST Project-approximate cost ₹ 102 lakhs).

RESEARCH & DEVELOPMENT PROJECTS IN NLCIL

Centre for Applied Research & Development (CARD) is the in house R&D Centre of NLC India Limited and has been recognized by the Department of Science & Technology. CARD is also carrying out various activities related to environmental measures like monitoring of air, water and soils dump. CARD is rendering analytical services to production / service units of NLCIL and other outside industries with its well-established analytical facilities. CARD has been granted NABL accreditation by National Accreditation Board for Testing and Calibration Laboratories (NABL), is based on the international standard ISO/IEC 17025:2005.

ON GOING RESEARCH & DEVELOPMENT PROJECTS

I. Electronification of Ground water Control & conveyor systems in Mines.

Implementing Agencies : NLC India Limited & National Institute of Technology / Tiruchirappalli

Total Approved Cost : ₹179.53lakhs, with duration of 18 Months

NLCIL is operating three mines deploying around 130 KMs of conveyers and 120 KMs of Ground water control pipe lines. As the area of mine is vast expanding and, it has become a necessity to monitor and control the full network electronically. Hence it is proposed to take up a project. Procurement action has been

initiated. The project is jointly taken up with NIT Trichy.

Proactive input for Ground water control system will enhance Mines production. Automation of Mining conveyor system will reduce break-downs. The sanction letter for the project has been received from MoC for fund allotment from CMPDI. The project start date is 01.01.2018. NITT has developed a Laboratory set up at NITT for the conveyor set up & GWC pumping modelling. The real time pumping data has been taken up at NLCIL mine for the analysis. Installation of GWC system completed on 30.08.19. For Conveyor system, procurement of equipment is in progress.

II. Use of Overburden Clay as alternate for coarse aggregate (OB to sand)

Implementing Agencies: NLC India Limited & Indian Institute of Technology, Madras.

Total Approved Cost : ₹173.00 lakhs, with a duration of 36 Months

The overburden formation is being removed and dumped during excavation. The overburden materials contain about 30 to 40 % of sand materials. It is proposed to explore the possibilities for extraction of sand from the overburden materials which can replace the river sand and also provides scope for additional revenue. A project proposal has been submitted to MoM and sanctioned on 30.10.2018 the project has been jointly taken up with IITM. OB samples were collected from NLCIL Mines and preliminary lab studies conducted. Pilot plant equipment for extraction of sand from over burden installed at CARD. OB samples taken from mines and about seventeen trials conducted. Processed sand testing is in progress at IITM. Further sampling, trials in progress.

III. IN HOUSE RESEARCH PROJECTS

- Drying of lignite using solar energy.
- Humic Acid - on farm demonstration studies and promoting Organic farming in Agriculture applications.
- Solar Cold Storage.
- Development of pilot scale Floating Solar system.
- Studies on Zeolite based catalyst for mitigation of exhaust gas pollution.
- Studies on Aqua culture development in Neyveli with Humic products.

- Pilot Plant studies on Beneficiation of Iron recovered from bottom slag.
- Development of mobile EV based air quality modelling for NLCIL".
- Development of alternative materials for pebbles using waste materials.
- Formation of Innovation –Incubation centre.
- Lignite to Diesel.