

JNARDDC



भारत 2023 INDIA

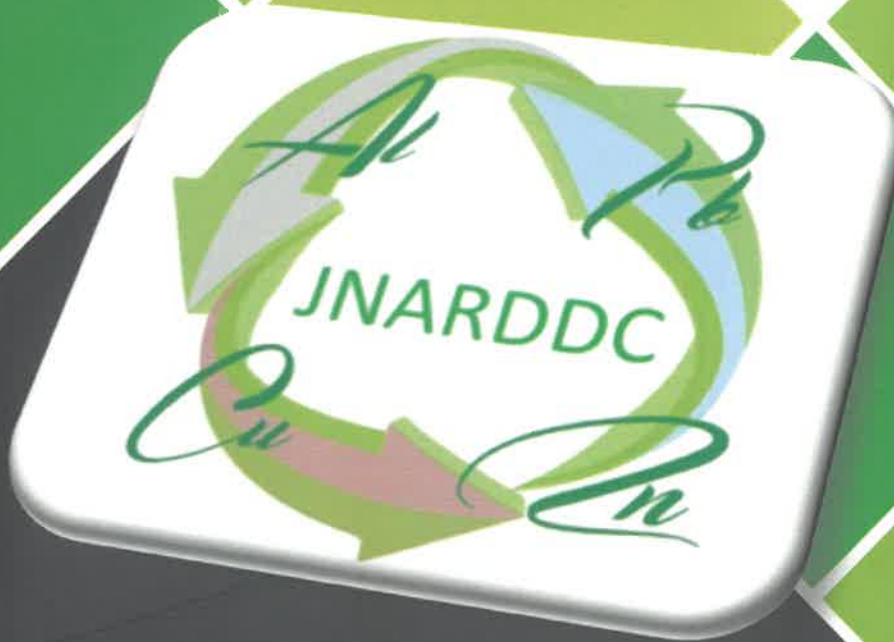
वसुधैव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE

ANNUAL REPORT

2022-23

Recycling - For Circular economy and sustainability



REUSE
REDUCE
RECYCLE



ANNUAL REPORT

2022-23



TC-8254

JNARDDC - ISO/IEC 17025:2017 & ISO-17034:2016 NABL Accredited Lab
Jawaharlal Nehru Aluminium Research Development & Design Centre
Autonomous Body under Ministry of Mines, Govt. of India
Amravati Road, Wadi, Nagpur – 440023
www.jnarddc.gov.in

CONTENTS

FROM DIRECTOR’S DESK..... 03

ABOUT JNARDDC 05

OBJECTIVES OF THE CENTRE..... 06

VISION &MISSION STATEMENT..... 06

RESEARCH AREAS..... 07

RESEARCH FACILITIES 08

PROJECTS COMPLETED 09

ONGOING PROJECTS 19

COLLABORATIVE WORK 24

PATENTS FILED / GRANTED 28

TECHNICAL PAPERS PRESENTED / PUBLISHED & CONFERENCES 30

ACADEMIC EVENTS..... 34

AZADI KA AMRIT MAHOTSAV.....40

TRAINING PROGRAMS..... 43

AWARDS / ACHIEVEMENTS 44

EVENTS..... 46

ORGANISATION CHART.....48

GENERAL BODY MEMBERS 49

GOVERNING BODY MEMBERS..... 50

RESEARCH ADVISORY COMMITTEE 51

PROJECT MONITORING COMMITTEE..... 52

SCIENTISTS AND STAFF 53

NEW EQUIPMENTS / FACILITIES OF JNARDDC.....54

ANNUAL ACCOUNTS 2022-23.....57

From Director's desk



I have the pleasure of presenting the 34th Report of Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur for the year 2022-23. With the dedicated efforts of our scientific & administrative workforce, we have completed five projects of S&T(Mines), DST and BALCO worth ₹3.18 crores. The Centre is executing seventeen projects of Science & Technology (Mines), DST and NALCO. Furthermore, several new projects were proposed to various agencies.

While carrying out the above R&D work, the Centre achieved revenue generation (IEBR) of ₹ 15.91 crores. Our scientists have published/presented 36 papers in national and international journals/conferences. One patent application was filed for an indigenous R&D process developed by JNARDDC and applaud the effort of the scientists and their team for grant of nine patents to JNARDDC.

NITI Aayog the country's think tank is spearheading the idea of sustainable manufacturing in the metal sector and to carry out this important groundwork, JNARDDC has been nominated as the Metal Recycling Authority (MRA) by the Ministry of Mines for non-statutory functions. In this regard, JNARDDC organized several meetings/brainstorming sessions of the stakeholders to promote a circular economy in non-ferrous metal (Aluminium, Copper, Lead and Zinc) sectors that has led to preparation of draft documents (i) Zero waste policies for primary, recycling and downstream industries (ii) Guidelines for mandatory dry stacking and utilization of red mud in cement industries (iii) Mandatory utilization of SPL in captive power plants and cement industries and (iv) SOP and compliance to air pollution norms for recovery of Zn from EAF/IF dust of steel industry (Zinc Sector)

A draft document related to "EPR provisions for Non-ferrous (Al, Cu, Zn, Pb) scraps and wastes for effective utilization" was also prepared and is under review by the Ministry of Mines for finalization. Under this EPR policy, it will be the responsibility of Producers (brand owners / OEMs) and Waste Generators to ensure the processing of their end-of-life products and/or wastes through recycling or utilization.

The Centre was granted ISO:17034-2016 accreditation (RC-1022) by the National Accreditation Board of Testing and Calibration Laboratories (NABL, New Delhi) for reference material production.

JNARDDC continued its proactive role in assisting BIS, Bureau of Indian Standards for standards for upgrading and formulating the guidelines for Al-scrap and Standards for aluminium alloys.

JNARDDC is the sector expert for the aluminium sector under the PAT-2 /3 (Perform, Achieve & Trade) Scheme in the National Mission for Enhanced Energy Efficiency (NMEEE) under the Climate Change Project for Bureau of Energy Efficiency (BEE), Ministry of Power

With diversification in coal characterization facilities and commendable performance as a referee lab for third-party coal sampling, the institute was able to achieve its all-time high internal revenue generation till date.

We acknowledge the support extended by the Ministry of Mines, General Body, Governing Body, Research Advisory Committee, Project Monitoring Committee, all the scientists and staff of the Centre, various aluminium industries (especially NALCO), as well as others (GSI, MECL, OMC / OMECL, CIMFR, QCI etc.).

With the rising awareness of sustainability, recycled aluminium usage across the world is estimated to cross 30 million tonnes by 2030. Aluminium plays a significant role in the development of the downstream sector, fostering the MSME ecosystem and enhancing domestic value addition. In-line with NITI Aayog's Circular Economy actions, JNARDDC continues to closely work on Zero-waste policies, and extended producer responsibility (EPR) strategies not only related to aluminium but also in copper, lead and zinc sectors. JNARDDC will also work on a skill gap analysis study in these four metal sectors by joining hands with IISSEC, Kolkata. JNARDDC will play a vital role in promoting the paradigm shift from a linear economy to a circular economy in the non-ferrous sector.

Dr A Agnihotri
Director

About JNARDDC

Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur is a “Centre of Excellence” set up in 1989 to provide a major R & D support system for the emerging modern aluminium industry in India by undertaking basic and applied research in the areas of bauxite, alumina and aluminium. It is a Rupees 35 crores joint venture, supported almost equally by the Ministry of Mines, Govt. of India and UNDP. The Centre is in its own sprawling campus just outside the orange city of Nagpur and became fully functional since 1996. With serene surroundings and housed in a modern technical complex with state of art equipments, provide just the right atmosphere for the scientists of the Centre to make creative contributions to the technological growth of the Indian aluminium industry. JNARDDC, a Central Government autonomous body of Ministry of Mines is registered under Societies Registration Act, 1860 (455/87-Nagpur dated 13.8.1987) and Bombay Public Trust Act, 1950 (F-6778-Nagpur dated 8.10.1987) as a Trust.

It's an ISO/IEC 17025:2017 and ISO:17034:2016 NABL accredited Lab and is recognized as a Scientific & Industrial Research organization by the Department of Scientific & Industrial Research, Ministry of S&T, Govt. of India. It is the only institute of its kind in India pursuing the cause of R&D from bauxite to finished product under one roof for the growth of aluminium Indian industry. The Centre with its limited and highly qualified manpower has developed a brand image for providing quality technical support services to primary and secondary aluminium industries. JNARDDC has made key contribution in the areas of beneficiation, characterization, technological evaluation, up-gradation of bauxites, reduction of energy consumption & environmental pollution, by effective utilisation of aluminium industry residue materials such as red mud, dross & scrap etc and process modelling for the benefit of aluminium industry and the nation.

The Centre also offers analytical and testing facilities to other non-ferrous industries, steel plants, small-scale industries, R&D organisations, and academic institutions particularly in the areas of chemical and mineralogical analysis, powder characterisation, thermal mapping, micro structural studies, mechanical and non-destructive testing, failure analysis and technical information.








- To assimilate and adapt the technologies suitable for raw materials available in India to produce alumina and aluminium and to develop indigenous know-how and basic engineering packages for future alumina and aluminium plants to be set up in the country.
- To undertake research programs especially in the area of reduction in material and energy consumption and to provide analytical services to the industries.
- To set up and operate data banks in the areas of bauxite, alumina and aluminium production for the benefit of the industries.
- To provide training to the personnel employed in the Indian aluminium industry through organization of workshops, seminars and group training programs.
- To provide technological assistance to the secondary aluminium industry especially in the areas of downstream processes and wastes recycling.

To be renowned nationally and globally as primary research hub for all aluminium products and processing



To undertake innovative research projects for providing complete technological solutions to meet the challenges for sustainability of aluminium industry

Research Areas

Bauxite	Alumina	Smelter	Aluminium	Others
				
Characterization Beneficiation Technological Evaluation	Alumina Technology Special Alumina	Smelter Process Cell Monitoring	Metal Forming Casting Alloy development Characterisation	Modelling Coal Testing Waste Management Energy & Environment

The Centre offers technological services in the following areas:

- Beneficiation and up-gradation of bauxites, laterites and low grade ores
- Characterization and technological evaluation of bauxites / laterites
- Process monitoring of aluminium electrolysis cell
- Characterization of coal, carbonaceous raw materials CP Coke and CT Pitch
- Chemical, Physical and Physico-chemical analysis
- Energy auditing and PFC measurements
- Alloy development and forming of aluminium alloys
- Microstructural, mechanical, electrical, EBSD characterization
- Melt loss assessment and remedial measures
- Process modelling

OUR ASSOCIATES



Research Facilities

Bauxite & Alumina Division

- Large Scale Alumina Laboratory
- Laboratory autoclaves, 5 & 10 Litre capacity
- Bomb Digesters & Total Organic Control (TOC)
- Low Temperature bath equipment
- Equipment for Precipitation Tests
- Angle of repose apparatus & Brick making unit
- Potentiometric Titrator
- Universal Impact Mill
- TLC Sample Spot Applicator
- Optical Scanning Densitometer
- Petrological Microscope
- Rotary & High temperature sintering furnace
- Lab flotation machine & Hydrocyclone test rig
- Granulating instrument
- Wet High Intensity Magnetic Separator
- Laboratory Ferrous Wheel Separator
- Rotap Sieve Shaker
- Bond Mill Index
- Density Instrument
- Halogen Moisture Analyzer

Analytical Division

- Classical Wet Chemical Laboratory
- X-ray fluorescence (XRF)
- X-ray Diffraction (XRD)
- Inductively Coupled Plasma- Optical Emission Spectrometer (ICP-OES)
- Inductively Coupled Plasma- Mass Spectrometer (ICP-MS)
- Glow Discharge Optical Emission Spectrometer (GD-OES)
- TGA- Moisture, VM, LOI Analyzer
- Bomb Calorimeter
- Humidity Chamber & Muffle Furnace
- Flame Photometer
- Double beam UV Visible Spectrophotometer
- Microwave Digestion System
- Ultrapure water Purification System
- Fusion Bead making Machine
- Pellet making Machine
- Nano-Milling Machine & Spin Coater
- Bench scale poly aluminium chloride unit
- Sulphur Carbon Analyzer

Downstream Division

- 100 kN Universal Testing Machine
- Scanning Electron Microscope +EDS & EBSD
- Vicker's hardness Tester
- Induction Melting & Heat treatment Furnace
- Metallurgical Microscope + Image analyzer
- Resistivity / High Precision Micro Ohm Meter
- Digital Rockwell & Brinell Hardness Tester
- Ultrasonic flaw detector
- Electro polishing machine
- Conductivity meter & Roughness meter
- Milling machine
- Hyperextrude software
- Extrusion modeling and simulation
- Anodizing lab
- Erichsen cupping test
- 14 MN Extrusion Press
- IR Pyrometer

Aluminium Electrolysis Division

- Specific Surface Area analyzer
- Mercury Intrusion Porosimeter
- Helium Pycnometer
- Thermal Analysis System, (TG & DSC)
- Specific Electrical Resistance (Anode)
- Mettler Softening Point Equipment
- Infra-Red Thermography
- Three Axis Magnetometer & Gauss meter
- Computer controlled Potentiostat / Galvanostat
- Thermal Conductivity Meter
- Photoacoustic Spectrometer (PFC Instrument)
- Data Acquisition and Processing System
- Heat Flux Meter
- Liquidus temperature measuring kit
- Lab Mixing and Kneading Machine
- Mathematical modeling

Projects Completed in 2022-23 :: 5 nos.

S-31: Bench scale study on extraction of pure Silica and smelter grade Aluminium Fluoride from Coal Fly Ash (CFA)- S&T Mines



Objectives:

To undertake a bench scale study which will result in establishing the process for extraction of pure silica and smelter grade aluminium fluoride. The coal fly ash (CFA) generation in INDIA is about 200 million tons per annum containing ~30% alumina and ~60% silica. Hence it is estimated that the current demand of pure silica required for various applications and aluminium fluoride required for Indian aluminium smelters will be fulfilled by treatment of coal fly ash alone. This will help in saving the natural resources (bauxite, sand) and ensure proper utilization of coal fly ash.

Background:

- Coal Fly Ash (CFA) is one of the solid waste generated in thermal power plants during the process of power generation. India's commercial energy demand is met through the country's vast coal reserves and the coal fly ash generating from all coal-based thermal power plants are accumulating over the years which typically contains 27-31% alumina (Al_2O_3), 56-60% silica (SiO_2) and 9-13% oxides of elements (Ca, Mg, Na, Fe, Ti etc.).
- Pure silica is used in structural materials, microelectronics (as an electrical insulator, semiconductors etc.), and as components in the food and pharmaceutical industries.
- In this project work efforts were carried out to study bench scale (0.5-1 kg CFA) extraction of pure silica and aluminium fluoride by treating CFA with appropriate mineral acid.



Outcome:

- Successfully completed bench scale trials (0.5-1 kg CFA) for extraction of pure silica and aluminium fluoride by treating Coal Fly-ash (CFA) with appropriate mineral acid
- The process is found to be economically viable for high quality (3N+) silica (500-700 Rs/kg) at bench scale. A pilot study (~100 kg CFA) with an engineering firm will be undertaken followed by final design, including material & cost, with proof of concept.

S-33 : Utilization of aluminium dross to achieve zero waste – A bench scale study(S&T Mines)

Objectives:



Bench scale process demonstration to envisage the technical feasibility and process optimization for complete utilization of waste aluminium dross to achieve zero waste which also includes:

- Characterization and quantification of metallic Aluminium in Aluminium Dross.
- Process for Preparation of Poly-aluminium Chloride (PAC)/salts from Waste Aluminum Dross.
- Residual dross for Refractory Products application.

Background:

Aluminium dross represents a residue from primary and secondary melting processes. Dross are classified according to their metal content into white and black dross. White dross is of higher metal aluminium content and it is produced from primary and secondary aluminium smelters and re-melt shops, whereas black dross has a lower metal content and is generated during aluminium recycling (secondary industry sector). White dross may contain from 15 to 70% recoverable metallic aluminium and it comprises a fine powder from skimming the molten aluminium. Black dross typically contains a mixture of aluminium oxides and slag, with recoverable aluminium content ranging between 12 to 18%, and much higher salt content (typically higher than 40%) than the white dross. The non-metallic residues generated from dross smelting operations is often termed 'salt cake' and contains 3 to 5% residual metallic aluminium. A conservative estimate of around 3 million tonnes of white dross and more than 1 million tonne of black dross is being produced every year and about 95% of this is landfilled. It was also reported that some portion of the dross is reprocessed by primary and secondary aluminium industries to recover metallic aluminium.

As the composition of aluminium dross is found to vary significantly from batch to batch, more focus is required to find potential applications for this material. Through cost effective recovery processes, aluminium metal can be recovered by means of physical and chemical route, metallic aluminium could be recovered by smelting and rest of the metallic aluminium could be extracted by chemical leaching in the form various salt such as alum/ poly-aluminium chloride/salts as water aids. Residue (aluminium oxides) after metal recovery from dross find applications in metallurgical and refractory industry. Thus, the project of bench scale process demonstration to envisage the technical feasibility and process optimization for complete utilization of waste aluminium dross to achieve zero waste has been undertaken.

Demo of PAC Unit conducted on 23.01.2023



Outcome:

- Complete characterization of raw material with respect to the quantification of aluminium and other impurities (i.e., Fe, Mg, Ti, Mn, Nitrogen, Fluoride etc.) was done. Around 20 % of metal content was found in dross supplied by industry partner M/s. Shanark Industries Ltd.

- Lab scale trials for the preparation of poly aluminium chloride (PAC) and castable refractory from dross were carried out. The characteristics of lab scale developed PAC showed encouraging result. Coagulation performance of lab developed PAC was studied on waste/raw water. Bench scale trial was carried out on this unit with 5 kg dross which was successfully converted into PAC using fabricated unit. So far 10-15% Al₂O₃ content in liquid PAC and basicity up to 83% has been achieved.



- After optimization, bench scale study for 10 kg batch was successfully done. A demo to secondary dross producers of the bench scale process conducted on 23rd Jan 2023 and proposal for setting up 1-ton capacity PAC plant submitted to industry for their commercial use.
- The poster presentation on "Preparation of poly-aluminium chloride; a bench scale study" was awarded the 2nd best prize at the 26th International conference on Nonferrous Metals ICNFM-2022, Nagpur.

S-34: Production and certification of certified reference materials (CRMs) for the analysis of aluminium alloy (S&T Mines)



Objectives:

To produce Certified Spectro Reference Materials (CRMS) for aluminium alloys and make them available at JNARDDC with traceability at an affordable price for the benefit of the aluminium industry, particularly secondary aluminium industry.

Background:

Optical emission spectroscopic methods are some of the most useful and flexible means of performing elemental analysis on samples taken from a batch of molten metal. There are many sources of errors while operating spectroscopy and these can be controlled by proper use of reference materials. Also, these spectroscopic techniques are calibrated using certified reference materials (CRMs) with chemical composition close to that of the sample to be analyzed. A certified reference material (CRM) is used for assessing and calibration of these spectroscopic techniques. Aluminium recycling industry is growing in India owing to its lower energy consumption and environmental impact compared to primary aluminium production. India has a long way to go to become a major aluminium recycler. Usually, secondary aluminium is contaminated as it uses aluminium scrap from various sources. This may lead to manufacturing of aluminium products which are inferior in terms of quality and this is a threat to the society and the industry as the market will be flooded with lower grade aluminium products which is a threat. Thus, analysis of elemental composition is a must before casting to ensure compositional requirements. Spectrochemical CRMs are essentially required for calibration and cross checking of spectrochemical equipments. There are only a handful of major suppliers of CRMs around the world who produce a wide range of CRMs and primary aluminium producers are financially sound to import quality CRMs from across the world. There are very few CRM producers in the country who provide very limited traceability and moreover CRMs produced cover a limited range of aluminium alloys. This poses difficulties to aluminium recyclers in selection of CRMs appropriate for testing their products. Thus, there is an increasing demand for quality and affordable CRMs in the country due to growing recycling industry.

Being accredited by NABL for its testing facilities, JNARDDC is well placed to produce CRMs and make them available for secondary melters in the country at an affordable price. Even the primary aluminium industry will be benefitted as they can buy quality and wide range of CRMs in our country itself. Also, this project supports the “Make in India” initiative launched by our government and caters to the needs of sec aluminium industry of our country.



The CRM facility was formally inaugurated by Shri Vivek Bharadwaj, Secretary (Mines) in Dec 2022

Outcome:

- Four (AA-6063, 7075, 2024 & 3103) reference material was produced in-house through extrusion. Statistical analysis of discs (prepared from candidate material) carried out as per ISO guide 35 confirmed that they are chemically homogenous and suitable for next step in CRM manufacturing.
- Know-how for production and certification of CRMs established. NABL awarded ISO 17034 Accreditation in March 2023. JNARDDC has successfully demonstrated the CRMs to NALCO and other parties. The CRMs will be marketed for commercial use.

P-62 :TPN:59031 Instrument for Instantaneous and onsite measurement of aluminium electrolysis bath parameters : DST, New Delhi



विज्ञान एवं
प्रौद्योगिकी मंत्रालय
MINISTRY OF
**SCIENCE AND
TECHNOLOGY**

सत्यमेव जयते

Objectives:

Efficient aluminum electrolysis cell operation requires precise control of material and thermal balances. Current methods involving sampling and analysis of key parameters result in delayed and outdated information for decision-making. Real-time measurement of bath ratio, alumina concentration, bath temperature and superheat are crucial for dynamic control. Developing an instrument for instant measurement of these core parameters is essential to enable immediate and accurate adjustments, ensuring optimal cell performance without reliance on outdated data and guesswork.

Background:

The efficiency of the aluminium electrolysis cell depends on sophisticated control for maintaining the material and thermal balances by regulating resistance, bath chemistry and alumina feed. Reasonable control of the cell is dictated by reliable and accurate measurement of the cell's vital operating parameters (bath ratio, alumina concentration, bath temperature and superheat). Present practice in smelters involves routine bath sampling, subsequent chemical analysis, and pot temperature measurement. It takes 12-24 hours before results are known, and corrective actions can be taken. Hence, presently control decisions in material and energy input have to be made primarily relying on old information and empirical guessing.

JNARDDC has already developed the methodology to establish the relationship of cooling curve with bath parameters on the basis of plant and lab experiments and has successfully developed the basic instrument for instantaneous measurement of important bath parameters. The project aims to develop the instrument which can be used in plants for regular measurements of bath parameters by addition/changes in the basic instrument in the terms of software & hardware for its commercialization.



Outcome:

- Developed an instrument that unites all the measurements into one single measurement (measurement time ~ 5 minutes), which can be used to control the cells based on real-time bath parameters. This instrument will help the smelters provide all the critical real-time information necessary for optimal control of the cell. The principle of thermal analysis has been used to develop the instrument. When an aluminium electrolysis bath is subjected to cooling/heating, it undergoes several phase transformations/changes accompanied by energy changes (ΔH). After choosing the suitable technique, the instrument was developed.
- The lab and plant experiments for varying bath compositions generated sufficient data with the help of the designed instrument. These data were correlated mathematically and graphically. This instrument and the correlation give core bath parameters by measuring real-time thermal changes. The advanced demo Instrument developed under this project was successfully validated in BALCO smelter plant.

P-64 :Development and Supply of an Instrument for Instantaneous Onsite Measurement of Bath Parameters; BALCO, Korba



Objectives:

To development and supply an instrument for instantaneous onsite measurement of bath parameters

Background:

JNARDDC has developed unique equipment capable of simultaneous measurement of vital bath parameters which will prove to be a boon to the aluminium smelters. Measurement time is around 5 minutes and all bath parameters are instantly available which otherwise are measured separately and requires sufficiently long time (12-14 hrs). The real time bath parameters information made available by the Instrument can easily be coupled with the other known pot operating conditions such as noise, voltage modifiers and state of feed control which helps in improved energy efficiency, current efficiency ultimately leading to enhanced cell performance.



Outcome:

- The instrument was developed and fine-tuned by undertaking studies at the BALCO plant conditions to meet Balco's requirements.
- Based on successful plant trials, developed the unique equipment capable of simultaneous measurement of vital bath parameters which will prove to be a boon to the aluminium smelters. Measurement time is around 5 minutes and all bath parameters are instantly available which otherwise are measured separately and requires sufficiently long time (12-14 hrs). The operators were trained and the instrument was handed over to BALCO.

Ongoing Projects 2022-23 : 17 nos.

Sponsored by Ministry of Mines (SSAG): 13

SN	Project details	Remarks / outcomes
1.	<p>S-35: Geo-technological evaluation of Bauxite and Laterite deposits of Chhattisgarh State by using Geospatial technology under Smart Mining 4.0</p> <p><i>(Chhattisgarh Council of Science & Technology, Government of Chhattisgarh, Raipur)</i></p> <p>Mar 2022 (2 yrs)</p>	<p>There is currently limited geo-technological information about Chhattisgarh bauxite and laterite deposits to confirm utilization for metallurgical and non-metallurgical applications. Accordingly, JNARDDC has joined with the Chhattisgarh Council of Science & Technology, Government of Chhattisgarh, Raipur, to undertake this project. The project outcome will lead to the creation of a digital database which will be highly useful in identifying suitable deposits for industrial applications using geo-informatics technology. It will assist the state govt in auctioning blocks. Efforts will be made to make the database available through Mobile APP.</p>
2.	<p>S-36: Solid-state recycling of aluminium chips (waste) for production of billets for pilot scale extrusion</p> <p>Mar 2022 (2 yrs)</p>	<p>This project aims to utilise aluminium swarf/ chips (waste) of AA6063 and AA2024, which are generated during the machining of components, to produce aluminium billets for extrusion.</p>
3.	<p>S-37 / P-63: Technology Development for Holistic Utilization of Red Mud for Extraction of Metallic Value & Residue Utilization</p> <p><i>[NML, Jamshedpur, IMMT, Bhubaneshwar, NALCO, HINDALCO & VEDANTA] under the aegis of NITI Aayog</i></p> <p>Oct 2021 (3 yrs)</p>	<p>Under the NITI Aayog initiative, the primary industries and 3 R&D labs have joined hands to develop feasible processing options for all metal extraction and REE enrichment from red mud and further research, development and commercialization to other industries. The outcome will lead to the development a Master Flowsheet for selected grades of red mud with energy and material balance equipped with techno-economic feasibility.</p>

SN	Project details	Remarks / outcomes
4.	<p>S-38: Red mud valorisation to achieve zero waste, conversion of residue into diagnostic x-ray shielding tiles after recovery of scandium (CSIR-AMPRI, Bhopal) :</p> <p>Mar 2022 (2 yrs)</p>	<p>The main objective of this project is to convert red mud into economically useful, high-energy X-ray and gamma-ray shielding blocks suitable for building radiation therapy bunkers, nuclear power plants, food sterilization plants, etc., and thereby promote the zero-waste concept.</p>
5.	<p>S-39: Development of medium strength Al-Mg-Si (AA6082 based) alloy for high-end strategic applications (extruded or drawn tubes) (IIT Gandhinagar)</p> <p>May 2022 (2 yrs)</p>	<p>Aluminium tube industry is currently battling with low strength of the finished product using AA6082 alloy.</p> <p>This project aims to develop medium-strength Al-Mg-Si (AA6082) based alloy with optimized composition and heat treatment schedule and achieve higher mechanical properties. Developing material for domestic space, aerospace and defence applications and the better material available as a domestic product will allow more future products to be developed domestically as a Atma Nirbhar Bharat Mission.</p>
6.	<p>S-40: Un-diluted Recycling of Cast Aluminium Alloys Containing High Fe Impurity Suitable for SMEs</p> <p>(BML MUNJAL University, Gurgaon and Ramakrishna Engineering College, Coimbatore)</p> <p>May 2022 (2 yrs)</p>	<p>Presently the standard operating procedure to convert the Fe-rich β-phase inter-metallics in aluminium alloys is unavailable. Hence JNARDDC, with its partners, has undertaken this project to address this need of the aluminium recycling industry to enhance the Fe tolerance of aluminium alloys. Removal of Fe in recycled aluminium will improve mechanical and metallurgical properties and reduce the cost by about 15% compared to dilution with primary aluminium. The findings will evolve the technical know-how for Fe reduction/modification for recycling Zorba and assorted turnings scraps to suit SMEs and Aluminium scrap recycling industries.</p>

SN	Project details	Remarks / outcomes
7.	<p>S-41: Production of Onyx grade ATH (sodium bicarbonate route) using low-grade Bauxite from Kutch region of Gujarat. S&T(Mines) (Kalinga Institute of Industrial Technology, KIIT, Bhubaneshwar and industry partner - NIKNAM Chemicals Pvt. Ltd)</p> <p>July 2022 (2 yrs)</p>	<p>The Kutch bauxite deposits of Gujarat are low-grade ore due to low alumina and high iron and silica content. Hence it remains unutilized as it cannot be used for alumina production. The project aims to develop a novel process for obtaining onyx-grade ATH through bicarbonate route. The innovative process may have multiple technical and operational advantages to produce onyx grade ATH, which is used to manufacture solid surface cast polymers/synthetic marble applications. The product ATH for synthetic marble/onyx application will also be validated.</p>
8.	<p>S-42 : Fabrication of Al₂O₃ containing cellulose based Ag NPs encapsulated collagen dressing and investigation of its therapeutic opportunities in diabetic wound healing (Kalinga Institute of Industrial Technology, Bhubaneshwar)</p> <p>Dec 2022 (2 yrs)</p>	<p>Chronic wounds are conventionally addressed using various FDA-approved silver-based formulations and other biomaterials. To overcome this issue an alternative material viz alumina (Al₂O₃) is being tried in wound management device. R&D on Al₂O₃ will be done at JNARDDC and KIIT will use its facility at School of Biotechnology for tests and validation related to animal toxicity and will source biological samples from its hospital (KIMS) for the developed healing material.</p>
9-11	<p>S-43, 44 & 45 : Techno Economic survey of Copper, Lead and Zinc recycling industry in India:</p> <p>Dec 2022 (1 yr)</p>	<p>The present survey will assist the Ministry of Mines in establishing the techno-economic status of the copper, lead and zinc recycling industry in the country and eventually help in current policies & formulation of future policy matters relating to Circular economy in the country.</p>

SN	Project details	Remarks / outcomes
12.	<p>S-46 : Development of low cost filler material utilizing Lithomargic clay for paint industry as per IS 68 2006 standard</p> <p>(Industry partner: Mundle Paint and Chemicals, Bhandara)</p> <p>Mar 2023 (2 yrs)</p>	<p>The bauxite deposits of Central India are associated with lithomargic clay resources. However, these resources are not using by mine owners as well as aluminium industry. The project aims to utilize Lithomargic clay for development of low-cost filler material for paint industry as per IS:68 (2006) standard and to validate product (filler) as per norms of Indian standards for paint industry.</p>
13.	<p>S-47: Development of prototype aluminium seat frame for passenger buses. (Joint project with Automotive Research Association of India)</p> <p>Jan 2023 (2 yrs)</p>	<p>The existing seat structure is made of steel material for a 2x2 passenger bus seat frame which weighs about 15-18 Kg per seat. The project aims to design and develop lightweight aluminium seat frame for passenger bus application. By replacing it with medium strength alloys such as AA6061, AA6082 it will bring a saving of 5-6 Kgs/seat. With the collaboration of ARAI it is proposed to simulate the die design, die fabrication and extrude the profiles and validate the prototype of aluminium seat frame for passenger vehicles as per AIS 023 standard.</p>

(B) Sponsored by Industry / other organizations (Ongoing) - 4

SN	Project Details	Remarks / Outcomes
14.	<p>N-47: Development of Process for 4N High Pure Alumina (HPA) and Substrate Making for its Validation in LED applications</p> <p>Mar 2021(2½ Years)</p> <p>NALCO, Bhubaneswar Odisha</p> <p><i>(IIT, Bhubaneswar & Anna University)</i></p>	<p>The project aims to develop an indigenous process to prepare 4N (99.99%) pure-grade alumina (HPA) that has the potential for use in LED applications.</p>

SN	Project Details	Remarks / Outcomes
15.	<p>N-48: Development of DC cast Al Alloy for Yoke in automobile applications, NALCO Bhubaneswar (with ARAI Pune)</p> <p>May 2022 (2 Years)</p>	<p>An automotive yoke is usually made of steel or cast iron. Aluminium alloys are widely used in automotive applications due to their excellent strength-to-weight ratio, significantly reducing fuel consumption and enabling them to meet emission norms. The project aims to develop a new DC cast Al Alloy followed by the development of the prototype yoke used in automobile applications.</p>
16.	<p>N-49 : Demonstration cum heat treatment, leaching-recycling and liming study of JNARDDC-NALCO process (by utilizing 50-60 kg batch of 1st cut SPL); NALCO Bhubaneswar</p> <p>Mar 2022: 1 year</p>	<p>Based on the success of bench scale studies (1kg) for detoxification of 1st cut SPL material and recovery of caustic and fluoride, JNARDDC has undertaken the Demonstration cum heat treatment, leaching-recycling and liming study of JNARDDC-NALCO process by utilizing 50-60 kg batch of 1st cut SPL. The project aims to provide the mass balance, CAPEX and OPEX for scaling up the process to commercial level.</p>
17.	<p>P-61: TPN:59025 Instrument for Realtime measurement of anode current distribution of aluminium electrolysis cell</p> <p>Dept of Science and Technology</p> <p>(DST, New Delhi)</p> <p>Mar 2021(2y 9m)</p>	<p>The project aims to develop an instrument which will be able to make real-time continuous measurements of ACD in place of the existing manual measurement system for its successful commercialization in the industry.</p>

Collaborative Work



JNARDDC is collaborating with the following agencies for various R&D projects and assignments.

1. **NITI AAYOG:** Development of effective handling, storage, usage and management of red mud is a major concern for the global community as a whole. In order to make India self-reliant in Rare Earth Extractions ("REEs"), NITI Aayog has identified many secondary resources for rare earth extraction among which Red Mud is the only known resource of scandium, a REE, which is more enriched as compared to native bauxite. Under the aegis of NITI Aayog multiple institutions including JNARDDC are involved in development of feasible processing options for all metal extraction from Red Mud.
2. **Kalinga Institute of Industrial Technology, KIIT, Bhubaneshwar :** JNARDDC is executing two R&D joint projects with KIIT (i) Production of Onyx grade ATH (sodium bicarbonate route) using low-grade bauxite from Kutch region of Gujarat & (ii) Fabrication of Al₂O₃ containing cellulose based Ag NPs encapsulated collagen dressing and investigation of its therapeutic opportunities in diabetic wound healing.
3. **BML MUNJAL University Gurgaon & Ramakrishna Engineering College, Coimbatore** have collaborated with JNARDDC in executing the project S&T (Mines) Un-diluted Recycling of Cast Aluminium Alloys Containing High Fe Impurity Suitable for SMEs
4. **Department of Science and Technology (DST):** JNARDDC has completed the project - Instrument for Instantaneous and onsite measurement of aluminium electrolysis bath parameters and the other project titled "Instrument for Realtime measurement of anode current distribution of aluminium electrolysis cell" is ongoing under various R&D programs of DST.
5. **Chhattisgarh Council of Science & Technology :(CCOST), Raipur** an autonomous body of Government of Chhattisgarh joined hands with JNARDDC for Geo-technological evaluation of Bauxite and Laterite deposits of Chhattisgarh State by using Geospatial technology under Smart Mining 4.0. The joint venture activity for Bauxite Mining 4.0 will open up new vistas for utilization of advance RS, GIS, GPS technology in the area of laterite and bauxite ore utilization by the aluminium industries.

6. **CSIR - Advanced Materials and Processes Research Institute AMPRI, Bhopal** : JNARDDC and AMPRI, Bhopal have undertaken a joint project which aims to convert red mud into economically valuable very high energy X-ray and gamma ray shielding blocks, which is suitable for building radiation therapy bunkers, nuclear power plants, food sterilization plants, etc., and thereby to promote the zero-waste utilization of red mud.



MOU with AMPRI, Bhopal: 02.09.2022

MOU with CCOST, Raipur : 11.05.2022

7. **MRAI (Material Recycling Association of India), NALCO, NMDC & MSTC** : JNARDDC along with above organisation has chalked out a plan to conduct 75 major circular economy campaign events all over the nation on the occasion of Azadi Ka Amrit M-ahotsav to commemorate the 75th year of India's independence –The program focuses on sustainability in Ferrous and Non-Ferrous Metals (Aluminium, Copper, Lead, and Zinc).
8. **CSIR - Institute of Minerals and Materials Technology, IIMT Bhubaneswar**: A multi-institutional project “Technology Development for Holistic Utilization of Red Mud for Extraction of Metallic Value & Residue Utilization” is under process”.
9. **CSIR - National Metallurgical Laboratory NML, Jamshedpur** : Under the aegis of NITI Aayog multiple institutions including NML, Jamshedpur are involved in development of feasible processing options for all metal extraction from Red Mud “Technology Development for Holistic Utilization of Red Mud for Extraction of Metallic Value & Residue Utilization”

10. **Bureau of Indian Standards (BIS):** JNARDDC provided its invaluable inputs to BIS for formulating standards for aluminium scrap and other aluminium alloys.
11. **Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India** JNARDDC is the aluminium sector expert under PAT-2 / PAT-3 (Perform, Achieve & Trade) Scheme in the National Mission for Enhanced Energy Efficiency (NMEEE) under Climate Change of Bureau of Energy Efficiency (BEE), Ministry of Power. The Centre has successfully carried out technical evaluation under PAT schemes to support the BEE in reducing energy consumption of aluminium sector. The recommendation will help BEE in generation and trade of e-certificates under PAT scheme. It will also be useful in setting up energy reduction targets for PAT-3 scheme. The scheme details are available on <https://beeindia.gov.in/sites/default/files/Aluminium.pdf>
12. **IIT, Bhubaneswar & Anna University:** NALCO, Bhubaneswar sponsored project “Development of Process for 4N High Pure Alumina (HPA) and Substrate Making for its Validation in LED applications” is in its second year of execution in collaboration with IIT-Bhubaneswar and Anna University. India does not have a production base of LED due to import of 3N and 4N alumina. In view of the market, product potential and availability of raw materials in India, the project outcome has a commercial potential to add to the vision of Make in India program suitable for LED (Light Emitting Diode) and Semiconductor applications.
13. **Automotive Research Association of India (ARAI), Pune** is the leading automotive R&D organization of the country affiliated to the Ministry of Heavy Industries, Government of India. ARAI is the prime Testing and Certification Agency notified by Government of India under Rule 126 of Central Motor Vehicle Rules, 1989. JNARDDC and ARAI have taken a joint project sponsored by S&T(Mines) for Development of prototype aluminium seat frame for passenger buses and by NALCO for development of a new DC cast Al Alloy followed by development of the prototype yoke used in automobile applications.

14. **Ministry of Mines: JNARDDC** is the designated aluminium sector expert / nodal agency for the following key authorities:

- Zero waste policy for nonferrous primary and secondary sector
- Metal Recycling Authority (MRA) - to carry out the non-statutory functions earmarked for MRA as stipulated in the “National Non-Ferrous Metal Scrap Recycling Framework 2020”

15. **Indian Iron & Steel Sector and Non-Ferrous Industries Skill Council (IISSSC) Kolkata** entered into a MoU on 30th Sept 2022, to establish a collaboration for imparting employable skill training in several occupations related to technical development in Non-Ferrous Metal Sector, leveraging JNARDDC’s technical knowledge and expertise. JNARDDC will be the exclusive partner to IISSSC to identify all job roles related to NF metal industry, provide training, engage training partners, develop qualification standards for the trainers, develop assessment criteria, etc. JNARDDC will help in training in the areas of Operations Management, Quality, Reliability and Maintenance, Ergonomics and Safety, Logistics and Supply Chain Management, Productivity Enhancement Studies, Industry 4.0 job roles essential for non-ferrous metal industries, as well as its downstream engineering industries.



Also,


JNARDDC will conduct Skill Gap Analysis Study in Non-ferrous Sector of Aluminium; Copper; Zinc and Lead in respect to critical operational areas. The above initiative will give an impetus to the “Pradhan Mantri Kaushal Vikas Yojana” (PMKVY) flagship scheme of the Ministry of Skill Development & Entrepreneurship (MSDE) which will enable a large number of Indian youth to take up industry-relevant skill training that will help them in securing a better livelihood.

P a t e n t s



The following patent applications were filed/ granted under the Patents Act, 1970 for various indigenous R&D process developed by JNARDDC under various research projects.

FILED - 1

Sn	Details	Title of Patent
1.	202221024081 [2022-23] Dated 25.04.2022 	A process for beneficiation and enrichment of rare earth elements in bauxite residue. Dr. Upendra Singh, Sonali Thawrani, Jyoti Pendam, Mayur Tirpude, Anupam Agnihotri

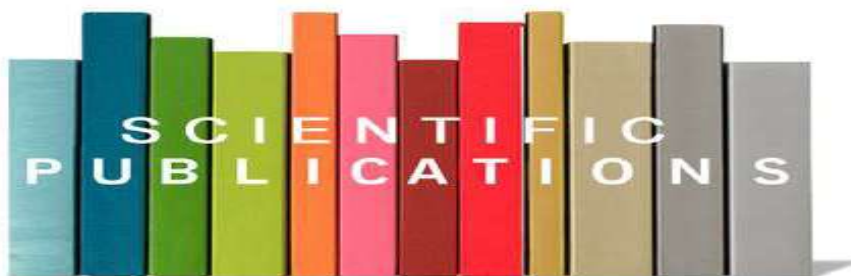
GRANTED – 9



SN	Details of granted patent
1	A process for preparing smelter grade alumina: Granted vide no. 404896 on 29/08/2022 Inventors : S B Rai, M J Chaddha, M T Nimje, R J Sharma, K J Kulkarni & K R Rao (JNARDDC)
2	Process for preparation of low ferric alum from waste or low grade aluminium dross Granted vide no. 406384 on 12/09/2022 Inventors : Dr Upendra Singh, J Mukhopadhyay, (JNARDDC) & Binuta Patra and P Bandopadhyay (NALCO)
3	"A process for conversion of Hazardous 1st Cut SPL Waste of Aluminium Industries into Non Hazardous Material by Converting Inorganic Toxic Cyanide to Non Toxic Species by Selective Heat Treatment and Recovery of Sodium, Fluoride and Carbon Value Granted vide no. 407276 on 21/09/2022 Inventors : M T Nimje, Md Najar Anupam Agnihotri, (JNARDDC) & A S P Mishra (VEDANTA)

SN	Details of granted patent
4	<p>A process for selective leaching of iron from alumina hydrate Granted vide no. 407793 on 28/09/2022 Inventors : Dr Md Najar, M T Nimje, S P Puttewar, Anupam Agnihotri (JNARDDC) & Subrat Kar, V Krishna Kumari P K Behera, (NALCO)</p>
5	<p>A Light Weight Foamed Geopolymer (LWFGPOP) and its preparation Granted vide no. 409005 on 12/10/2022 Inventors : Dr Md Najar, Mukesh Chaddha, Pravin Bhukte, Numanuddin Azad, Shama Wadsariya, Suresh Puttewar, Anupam Agnihotri (Jnarddc) And Saket Jain (Swarnalatha Holdings)</p>
6	<p>A Process for selective reduction of Al₂O₃, SiO₂, Na₂O and CaO in reed mud for enrichment of Fe₂O₃ Granted vide no. 421167 on 10/02/2023 Inventors : Dr Mohamed Najar, Shoeb Ansari, Shama Wadsariya, Kiran Janbandhu, Rajashekhar Rao, S P Puttewar and Anupam Agnihotri</p>
7	<p>A Process For Selective Enrichment And Separation Of Alumina And Silica Granted vide no. 427093 on 27.03.2023 Inventors : Dr Md Najar, Amrita Karan, Paresh Nageshwar, Mukesh Chaddha, Anupam Agnihotri</p>
8	<p>Partially Lateritised Khondalite based ceramic proppant and its preparation Granted vide no. 427235 on 28.03.2023 Inventors : Dr Pravin Bhukte, Suresh Puttewar, Mukesh Chaddha, Anupam Agnihotri, Gopal Daware (JNARDDC) & Bhimsen Pradhan, Bandopadhyay P (NALCO)</p>
9	<p>A process for delamination of a multi-layered packaging material and selective recovery of aluminium metal values Granted vide no. 427584 on 29.03.2023 Inventors : Dr Md Najar, Amrita Karan, Paresh Nageshwar, Ram Chouhan, Anupam Agnihotri</p>

Technical Papers Presented / Published & Conferences



JOURNALS

1. Multi-Layer Flexible Packaging: Solution for Sustainable Recycling; **P A Mohamed Najar**, MRAl's Material Recycling, 4(3), 2022,14-17
2. Nano processing of industrial rejects for controlling operational energy of buildings; Sandeep Tembhurkar, **Priyanka Nayar**, Numanuddin Azad, Upendra Singh, Mangesh Madurwar Advances in Civil Engineering; Jun 2022; <https://doi.org/10.1155/2022/2969266>
3. "Effect of geological, mineralogical characteristics on grindability of Bauxite: A case study on Indian lateritic bauxite deposits" **P G Bhukte**; Journal of the Geological Society of India, Vol.99, Jan 2023 pp 55-60, Springer, *SCIE*
4. Zero Residual Heavy Metals in Aqueous Media Using Composite Coagulant Converted from Bauxite Residue; **S. Hena**, N. F. bt Abdullah, L. C. Keong, **P. A. Mohamed Najar**, L. Gutierrez, J.-P. Croué; International Journal of Environmental Science and Technology, Iranian Society of Environmentalists (IRSEN) and Science and Research Branch, Islamic Azad University, Springer, 19 (07), 2022; <https://doi.org/10.1007/s13762-022-04336-z>, SCIE/SSCI, Indexed, Impact factor **3.519**
5. Influence of aluminum trihydrate (ATH) particle size on mechanical, thermal, flame retardancy and combustion behavior of polypropylene composites; **Malaya Ranjan Parida**, Smita Mohanty, Manoranjan Biswal, Sanjay K Nayak, **Suchita Rai**, Journal of Thermal Analysis and Calorimetry. <https://doi.org/10.1007/s10973-022-11851-1>. 08.12.022. Springer Nature, SCI, IF: 4.755
6. A critical review on nanomaterial based therapeutics for diabetic wound healing; **Swati Sucharita Singh**, Susanta Kumar Behera, **Suchita Rai**, Suraj Tripathy, Snakha Chakraborty, Amrita Mishra, Biotechnology and Generic Engineering Reviews, <https://doi.org/10.1080/02648725.2022.2161732>. 28.12.2022. Taylor and Francis, SCIE, IF: 4.200

7. Granulometry Impact on Digestion Efficiency and Cost-Economics in Alumina Refinery for East Coast Bauxite (India); **Suchita Rai**, M.J. Chaddha, Prachiprava Pradhan, K. J. Kulkarni, M. Panchal In: Broek, S. (eds) Light Metals 2023. TMS 2023. The Minerals, Metals & Materials Series. Springer, Cham. 156-165, 2023; https://doi.org/10.1007/978-3-031-22532-1_19.
8. An overview of research progress on ceramic-based membranes; **Prachiprava Pradhan**, Ajit P Rathod, Suchita B Rai, Soumya S Mohapatra, Materials Today: Proceedings, Elsevier, March 2023; <https://doi.org/10.1016/j.matpr.2023.03.300>
9. Use of red mud as advanced soil stabilization material, **Suchita Rai**, Sneha Bhadure, M. J. Chaddha, A. Agnihotri; *Advanced Materials from Recycled waste*, Book Chapter (Publisher: Elsevier), Chapter 3:2023 Pg: 45-56. <https://doi.org/10.1016/B978-0-323-85604-1.00016-0>

CONFERENCE PROCEEDINGS

26th International Conference on Non-Ferrous Metals (ICNFM 2022); 8-9 July 2022 - Hotel Radisson Blu, Nagpur, India

10. Standardization in Aluminium Recycling Practices; **R Anil Kumar**, K Immanuel Raju, R N Chouhan and Anupam Agnihotri
11. Study on the improvement of yield and formation of Tricalcium Aluminate using synthetic Bayer liquor: **Prachiprava Pradhan**, M J Chaddha, S B Rai, M Najjar, K J Kulkarni, Megha Panchal and A Agnihotri
12. Fabrication of Sapphire from 3N Pure Alumina prepared by Combustion Approach; **Priyanka Nayyar**, Pooja Yadav, Janakiraman Kumar, Upendra Singh, and Anupam Agnihotri
13. Anode current distribution system for aluminium electrolysis cell: **V K Jha**
14. Preparation of Poly Aluminium Chloride-A bench scale study; **Jyoti Pendam**, Sonali Thawrani, Mayur Tirpude Upendra Singh and Anupam Agnihotri

10th IBAAS-2022 Raipur; 15-17 Sep 2022

15. Non-metallurgical Grade Bauxite - Status & Future Prospects; Binder :Volume X; pp 212-223 ; **P.G. Bhukte**, G.T. Daware, M.J. Chaddha, A. Agnihotri, and G.P. Thakre (2022);
16. Anode current distribution system for aluminium electrolysis cell, **V K Jha**, R J Sharma, M T Nimje & A Agnihotri,
17. Industry 4.0 for Indian Aluminium Smelters, **V K Jha**, R J Sharma, M T Nimje & A Agnihotri

18. Precipitation process intensification using mixed seed in Bayer circuit; **Suchita Rai**, M. J. Chaddha Prachi Pradhan, R. J. Sharma, M. T. Nimje, K. J. Kulkarni, M. Panchal, A. Agnihotri
19. Synthesis of 3N Pure Alpha Nano-Alumina from Aluminium Foil; **Priyanka Nayar**, Pooja Yadav, Sandeep Kowe, Jyoti Pendam, Upendra Singh, Anupam Agnihotri
20. Effect of ram speed on evolution of Peripheral coarse grain during extrusion of AA2024 alloy **Immanuel Raju K**, V.N.S.U.Viswanath Ammu, Anil R, Anas N S, R N Chouhan and Dr Anupam Agnihotri
21. Production and Certification of Certified Reference Materials for AA 6063, **R Anil Kumar**, K Immanuel Raju, Anas N S, V.N.S.U.Viswanath Ammu, R N Chouhan, and Anupam Agnihotri

40th International Conference and Exhibition, ICSOBA 2022, Athens, Greece; 10-14 Oct 2022

22. Framework to Drive Resource Efficiency and Circular Economy in Indian Aluminium Sector, **Dr A Agnihotri**

International Conference & Exhibition on Mineral Business Development (MBD-2022): Prospects and Challenges of Mineral Based Products and Utilization of Wastes for the 'Make in India' Initiative, Nagpur, 10-12 Nov 2022

23. Commercial and Technical Prospects of Unused Mineral Values of Aluminium Industry; pp 246-255 **Mohamed Najjar**, Pravin Bhukte, Upendra Singh, Manoj Nimje and Anupam Agnihotri.
24. Beneficiation and Extraction of Strategic Scandium (Sc) from Aluminium Industry Waste Residue; **Upendra Singh**, Jyoti Pendam, Sonali Thawrani, Mayur Tirpude & Anupam Agnihotri
25. Characterization and Beneficiation of Pyrophyllite; pp 134-141; **P G Bhukte**, G T Daware, M J Chaddha, T P Bhosale, A Agnihotri
26. Potential application of Red Mud in Cement; **Suchita Rai**, M. J. Chaddha Prachi Pradhan, K. J. Kulkarni, M. Panchal, A. Agnihotri

IIM ATM 2022, 13-16 Nov. 2022, Hyderabad

27. Comparison of Peripheral Coarse grain formation in AA6063 and AA2024 aluminium alloys. **Immanuel Raju K**, V.N.S.U.Viswanath Ammu, Anil R, R N Chouhan and Dr Anupam Agnihotri

2nd International Conference on Water Technologies 2022, 01-02 Dec 2022

28. Synthesis and characterization of low-cost Cenosphere Ceramic membrane, **Prachiprava Pradhan**, Ajit P Rathod, S B Rai, A. Agnihotri

2nd International Conference on Construction Materials and Structures (ICCMS 2022), Department of Civil Engineering National Institute of Technology Calicut, Kerala, Dec 14-18, 2022.

29. Process for Recovery and Value Addition of Silica Mineral Values of Distingly Siliceous Mining Rejects; **Mohamed Najar**, Amrita Karn, Shweta Naik, Upendra Singh and Anupam Agnihotri
30. Feasibility Analysis of Mustard Husk Ash for the Development of Geopolymer Mortar; Vishakha Sakhare and **Mohamed Najar**

International Conference on advances in smart materials, chemical & biochemical engineering (Chemsmart-22), 16-18 Dec 2022.

31. Study on formation of Tricalcium Aluminate from Synthetic and Plant sodium aluminate liquor in Bayer process; **Prachiprava Pradhan**, M J Chaddha, S B Rai, K J Kulkarni, Megha Panchal, Anupam Agnihotri

International Aluminium Conference (IAC 2023); organized by AAI, Vedanta and Caproate Monitor, February 09-10, 2023, Jharsuguda, Odisha

32. Upgradation of low-grade bauxite- A case study of Mainpat deposit (Chhattisgarh, India); **Pravin G. Bhukte**, G. T. Daware, T P Bhosale & A Agnihotri

7th International Conference on Production & Industrial Engineering CPIE 2023, 10-12 March, 2023)

33. Peripheral coarse grain formation in AA2024 and AA6063 aluminium alloys - a comparative study **Immanuel Raju K**, V.N.S.U.Viswanath Ammu, Anil R, R N Chouhan and Dr Anupam Agnihotri

23rd International Conference on Powder Metallurgy, 13-15 March 2023, Mumbai

34. Effect of Preheat Temperature on Compaction of Machined AA2024 Swarf; **N S Anas**, Kapil kumar N Ramteke, R Anil Kumar, K I Raju, VNSUV Ammu, R N Chouhan, A Agnihotri

Indian Analytical Science Congress 2023, Kochi, Kerala, 23-25 Mar 2023

35. Role of Analytical Science in Achieving India's Centenary Sustainable Development Goals', **Upendra Singh** & Anupam Agnihotri

14th International Conference for Materials Processing and Characterization, 24-26th March 2023, GRIET Hyderabad ;

36. Effect of Compaction Pressure on Cold Compaction of AA2024 Swarf Generated during Milling Operation; **N S Anas**, K N Ramteke, R A Kumar, R N Chouhan, A Agnihotri

Academic Events

26th International Conference on Non ferrous Metals (ICNFM-2022) ; Radisson Blu, Nagpur on 8-9 July 2022 was co-organized by JNARDDC ; www.nonferrousmeet.net/

The 26th ICNFM-2022 was organized by Corporate Monitor in association with Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Material Recycling Association of India (MRAI), Aluminium Association of India (AAI) and supported by Ministry of Mines, Govt of India at Nagpur during 8-9th July 2022. The Conference witnessed a participation of around 125 delegates from India & abroad. Scientific excellence awards were given to Dr. B.K. Satpathy (Visiting faculty, IIT Bhubaneshwar), **Dr Upendra Singh (Head, Analytical, JNARDDC)**, Shri Rohit Pathak (HINDALCO) and Dr Bhavin Desai (Aditya Birla) for their contributions to respective fields.

Around 35 technical papers including 5 international papers and 14 posters were presented during the conference.



10th International IBAAS Conference & Exhibition- Raipur; **IBAAS 2022** September 14-17, 2022 and one day Brainstorming session on Non-Ferrous Metal Recycling was co-organized by JNARDDC : <https://www.ibaas.info/>

The 10th IBAAS conference co-organized by JNARDDC at Raipur. About 200 delegates representing the bauxite, alumina and aluminium industry, research organizations, technology/equipment suppliers, service providers, and academic institutes participated in this conference.



The second-day conference was devoted to a series of technical papers in 3 parallel sessions: Bauxite, Non-metallurgical bauxite-alumina and red-mud; Alumina and Aluminium Smelting and Downstream. About 50 high-quality technical papers were presented by Engineers / Scientists of leading primary aluminium producers, R&D Institutes, and technology and equipment suppliers.

An essential addition to this conference edition was the workshop by Aluminium Stewardship Initiative (ASI) on 16th September, which was held for the first time in India. Three best papers were awarded to young scientists and engineers.

One day Brainstorming session on Non-Ferrous Metal Recycling by JNARDDC

The nominated Metal Recycling Authority- MRA (JNARDDC), Ministry of Mines, organized a “One day Brainstorming session on Non-Ferrous Metal Recycling” on 17th September 2022 at Courtyard by Marriott, Raipur (CG) to bring all the stakeholders of NF Metal Recycling together on a common platform for meaningful interactions, exchange of ideas etc. This event is a part of the initiative to boost scrap recycling by spreading awareness of government’s agenda on Resource Efficiency and Circular Economy to make the non-ferrous metal industry sustainable and providing opportunity to the stakeholder industry to present their views. The Chief guest Mr Ved Prakash Mishra of the Ministry of Environment of Forest highlighted the importance of circular economy and aluminium recycling. Several representatives of MRAI (Material Recycling Authority of India), Bureau of Indian Standards, ASI and leading aluminium, copper, lead and zinc recycling companies participated and had intensive discussions on this industry’s present status and future.



The event observed distinguished deliberations from both the central & state government as well as representatives from non-ferrous metal recycling industry and industry associations. The event also witnessed participation of OEMs, equipment suppliers, service providers, students & faculty from National Institute of Technology Raipur.

40th International Conference and Exhibition, ICSOBA 2022

The International Committee for Study of Bauxite, Alumina & Aluminium during 10-14 Oct 2022 organized ISCOBA-2022 at Radisson Blu Park, Athens, Greece. Dr Anupam Agnihotri, Director, JNARDDC participated and delivered the keynote lecture on “Framework to Drive Resource Efficiency and Circular Economy in Indian Aluminium Sector”.



Foundation Day of JNARDDC and session on “Resource Efficiency in Non-Ferrous metal sector

JNARDDC celebrated its 33rd Foundation day on 25th May 2022. The event was inaugurated Chief Guest, Dr. Ashok Kumar Singh, Chief Scientist & HORG, CSIR, CIMFR, Dhanbad, Guest of Honour Shri Anil Kumar, DGM(FM), NTPC, Noida and Dr Anupam Agnihotri, Director, JNARDDC. The employees were felicitated for their technical achievements in patent, publication and projects.



The inaugural session was followed by a panel discussion on “Resource Efficiency in Non-Ferrous metal sector” by Directors of Metal Recycling Association of Indian (MRAI), Dr Kishore Rajpurohit on Aluminium, Shri Navin Sharma on Lead and Shri Jines Shah on Copper. The event was attended by ex-employees and delegates from IBM, GSI, VNIT, CIMFR, MRSAC, AMD, BMPL etc.

MINCON 2022

The second edition of the three-day National conclave, "MINCON 2022 – MINES, MINERALS, METALS," was held from 14-16 October 2022 at Chitnavis Center, Nagpur. It's co-organized by the Maharashtra State Mining Corporation Ltd. (MSMC), Vidarbha Economic Development Council (VED) and MM Activ Sci-Tech Communications Pvt. Ltd. JNARDDC has showcased its stall with various innovative R&D products and process.

Shri Pralhad Venkatesh Joshi, Hon'ble Union Minister of Parliamentary Affairs, Coal and Mines visited the JNARDDC stall and interacted with the scientists and staff.

Shri Joshi was briefed about the various achievements of JNARDDC in the field of bauxite, alumina, aluminum and diversification as Metal Recycling Authority and Referee lab for third party coal sample analysis. Other visitors included state minister Shri Dadaji Dagadu Bhuse and MD of Maharashtra State Mining Corporation Ltd.





The 108th session of Indian Science Congress 2023 (ISC), Nagpur

The 108th session of Indian Science Congress 2023 (ISC) was hosted by the Nagpur University at its Amravati Road Campus. The focal theme of this year's ISC is "Science and Technology for Sustainable Development with Women Empowerment." JNARDDC has showcased its stall with various innovative R&D products and process.



Dr. Jitendra Singh Hon'ble Union Minister of Science & Technology and Shri Devendra Fadnavis, Hon'ble Deputy Chief Minister of Maharashtra along with other top officials visited the JNARDDC stall and interacted with the scientists and staff.

Azadi ka Amrit Mahotsav



Government of India has initiated Azadi Ka Amrit Mahotsav to celebrate and commemorate 75 years of progressive India and the glorious history of its people, culture and achievements. Keeping in line with the Govt initiative, JNARDDC has undertaken the following programs under AKAM.

- **Health checkup camp Phase-1 (07.04.2022)**

JNARDDC in alliance with Lok Kalyan Diagnostics, Nagpur organized a health checkup camp in JNARDDC premises on 7th April 2022 as a part of the Azadi Ka Amrit Mahotsav events. Around 51 employees underwent health checkup in phase-1 covering CBC, serum cholesterol, RBS, serum, creatinine and thyroid test. ECG and other tests was taken up in Phase-2 with renowned multispecialty Kingsway hospital.



- **Iconic Week celebration – Mass Plantation Program (15.07.2022)**



JNARDDC, Nagpur undertook a mass plantation program as a part of the Azadi Ka Amrit Mahotsav (AKAM) iconic week celebration of Ministry of Mines. The iconic week mass plantation program on 15th July 2022 was inaugurated at the hands of Chief Guest - Ms Nirupama Kotru, IRS, Joint Secretary & Financial Advisor, Ministry of Coal & Mines. Mr Laxmikant M Padole, Director, Neem

Research & Technology Development Centre, Kalmeshwar, Nagpur showcased a brief film about the benefits of organic farming and mass plantation program for sustaining the environment for the future generations. All the employees and staff planted around 150 saplings provided by Social Forestry Division, Govt of Maharashtra and NRTDC, Nagpur.

- **Swachh Bharat Abhiyan**

JNARDDC undertook special campaign for cleanliness of all labs and office premises. Swachhata pakhwara was observed in October 2022 with a view to encourage the zeal of the above program. In the current year JNARDDC has undertaken the following activities under Swachhata Action Plan (i) Re-carpeting of office road of technical complex (ii) Mass Plantation programs (iii) Review and disposal of files



of record room (iv) Renovation of Guest House and sanitation facilities (v) Disposal of scrap. The 800 metres cement road of JNARDDC was inaugurated by Ms Nirupama Kotru, IRS, Joint Secretary & Financial Advisor, Ministry of Coal & Mines in July 2022.

- **75 kms Cycling event (31.07.2022)**

A “75 kms Cycling Event” was conducted on 31st July 2022 by JNARDDC. More than 100 cyclists from all over the city participated in the event which culminated in JNARDDC premises. The participants included renowned national and internationalist cyclists.



- **Har Ghar Tiranga (13-15 Aug 2022)**



JNARDDC distributed the national flag to all employees and staff during 'Har Ghar Tiranga' campaign which was undertaken under the aegis of Azadi Ka Amrit Mahotsav during 13-15 Aug 2022 to encourage

employees and staff to bring the Tiranga home and to hoist it to mark the 75th year of India's independence. The idea behind the initiative was to invoke the feeling of patriotism in the hearts of the people and to promote awareness about the Indian National Flag. All of them virtually pinned the flag and posted selfies with the national tricolour on the site.

- **'COVID Vaccine Amrit Mahotsav' campaign (15 Jul – 30 Sept 2022)**

'COVID Vaccine Amrit Mahotsav' campaign was launched on July 15, 2022 by Hon'ble Prime Minister of India to give an impetus to Precaution Dose as part of the national COVID vaccination drive. Under the campaign JNARDDC encouraged its employees and staff to avail the free precaution doses at all Government COVID Vaccination Centres for persons aged 18 years and above for 75 days (July 15 to September 30, 2022).

- **Fit India Freedom Run 2.0 (31.10.2022)**

Rashtriya Ekta Diwas was celebrated on 31st October 2022 in JNARDDC, Nagpur to pay tribute to the great Indian freedom fighter Sardar Vallabhbhai Patel who was instrumental in making a united India. His birth anniversary was celebrated by organizing the "Fit India Freedom Run - Azadi Ka Amrit Mahotsav" on 31.10.2022 from the JNARDDC technical complex. Around 75 employees and staff participated in the unity run of 3 kms. It was followed by march past by the guards of JNARDDC.

- **Lecture Series**

Scientists and officers of JNARDDC conducted 38 nos. of offline and online lectures on "Aluminium - From Mine to Metal" & Other topics during the March 2021 to Dec 2022 in various IITs, NITs, other engineering colleges and other institutions for promoting the awareness of the aluminium metal in the growth of the nation.

Training Programs

Training program for NALCO operators

Training programme on “Alumina making process” for NALCO operators was successfully conducted at JNARDDC from 18th -20th July 2022 and 12th – 14th October 2022 in two batches. Total of 33 operators attended this programme and the lectures were delivered in the areas of alumina making process (Bauxite Characteristics, Desilication, Digestion, Settling and Washing, Precipitation in Bayer process, Available alumina and Reactive silica determination, Advances in Alumina Technology, Special alumina, Alumina smelting etc.). Operators also visited different laboratories during their 3 days training programme. The operators from NALCO expressed that the theoretical knowledge gained will certainly help them in discharging their duties more efficiently and in turn improve the productivity and quality in the plant.

NABL 17025 training

Employees of JNARDDC were given training on ISO/IEC 17025: 2017 from 7th to 10th September 2022, by Dr. K N Udpa in an effort to provide in-depth knowledge about laboratory practices for testing. Dr. K. N. Udpa is a former employee of Tata Steel and a NABL assessor with extensive understanding in the area of chemical analysis and coal & other solid fuel testing.

ISO 17034 Awareness Training at JNARDDC

Ms Sanchita Bhattacharya from Consultrain Management Services (CMS), Kolkata visited JNARDDC to impart awareness training about quality management system requirements as per ISO 17034 in accordance with which reference materials shall be produced. During the training program, all the general requirements for the competence and consistent operation of reference material producers as specified in the ISO 17034 were discussed with all the personnel involved in RMP activities.

Awards / Achievements



Scientific excellence award to Dr Upendra Singh HoD (Analytical) in the 26th International Conference on Non ferrous Metals (ICNFM-2022) ; Radisson Blu, Nagpur on 8-9 July 2022.



2nd prize for the poster presented on “Preparation of poly-aluminium chloride; a bench scale study” : Jyoti Pendam, Sonali Thwrani, Mayur Tirpude, Dr. Upendra Singh and Dr A Agnihotri at ICNFM-2022



First prize in IBAAS-2022 Raipur for the paper “Synthesis of 3N pure Alpha- Nano Alumina from Aluminium Foil by Dr Priyanka Nayar, Dr Pooja Yadav, Sandeep Kowe, Jyoti Pendam, Dr Upendra Singh & Dr Anupam Agnihotri. 2022

Dr Anas N S, Junior Scientist was honoured with “Recognition Award” on 21st Sep 2022 by DAYA Kerala for his R&D contributions in the august presence of District Collector, Alappuzha, Kerala.



Atma Nirbhar award (IASC, Kerala)

The Indian Analytical Science Congress (IASC) Series was held during 23-25, March, 2023 at the IMA House, Kochi with the theme, The Role of Analytical Science in Achieving India's Centenary Sustainable Development Goals. ISAS also conferred various ISAS Awards for Exemplary Performance by Indian Scientists and Technologists, such as ISAS Global Indian Scientist Award, ISAS Aatma Nirbhara Award, ISAS Green Energy Award, ISAS Vikram Sarabhai Award, ISAS Life Time Achievement Award, etc to Leading Indian Scientists and Technologists who have demonstrated Exemplary Performance Efficiencies to earn India Prestigious Positions at National, International Levels. Dr. Anupam Agnihotri, Director, JNARDDC was awarded with the Aatma Nirbhara award for his scientific contribution and self-sustenance initiatives by Padma Shri Ravi Grover, Director, BNI, & KMG, Bhabha Atomic Research Centre (BARC) at the science congress at Kochi.



Events

Inauguration of labs at JNARDDC by Secretary (Mines)

Shri Vivek Bharadwaj, IAS, Secretary to the Government of India, Ministry of Mines undertook review of JNARDDC, Nagpur on 6th Dec 2022. Shri Bharadwaj inaugurated three new lab facilities (i) GEO-Analytical Lab equipped with carbon Sulphur analyzer, direct mercury analyzer & TCLP (ii) Reference Materials for the Analysis of Aluminum and Aluminum Alloys and (iii) Unit for AlF₃ and Silica (SiO₂) recovery from coal fly ash.



He also participated in the plantation program.



PERC review meeting at JNARDDC

The 23rd Project Evaluation & Review Committee (PERC) Meeting was held under the Chairmanship of Shri U C Joshi, Joint Secretary, Secretary, Ministry of Mines during 3rd – 5th August 2022, through video conference.

International Yoga Day

The International Yoga Day was celebrated by JNARDDC on 21.06.2022 with the theme “Yoga for Humanity”. All employees gathered and performed the yoga sequence in the office canteen



under the guidance of yoga trainer.

Welfare for Persons with Disabilities (PWD), Women, SC& ST.

The Centre is following the various government guidelines w.r.t PWD, SC, ST and OBC reservation.

Progressive use of Hindi

JNARDDC continued its efforts to promote the progressive use of Hindi. The Centre celebrated Hindi Pakhwada during 12-26 September 2022 which included several competitions. Director, JNARDDC emphasized the need for further use of hindi in day to day official use of the Centre’s activities.

Vigilance Awareness Week organized at JNARDDC

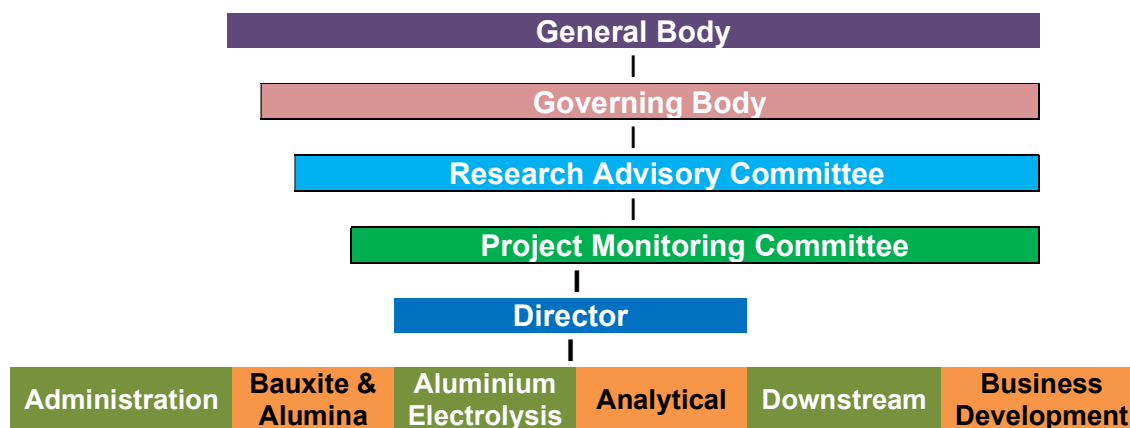
Vigilance Awareness Week was celebrated by JNARDDC during 31st Oct 2022 to 6th Nov 2022. The week-long program commenced with the Integrity Pledge. The main theme of this year was “भ्रष्टाचार मुक्त भारत – विकसित भारत” / “Corruption free India for a developed Nation” was widely propagated and employees were briefed about good vigilance practices for increasing the vigilance awareness for a corruption free India.

JNARDDC Organizational Chart: 2022-23



Shri Vivek Bharadwaj, IAS, Secretary to the Government of India, Ministry of Mines is the **Ex-officio chairman** of the **General Body** and **Governing Body** of JNARDDC. **Shri Sridhar Patra**, CMD, NALCO is the Ex-officio Vice Chairman of JNARDDC. The other committees include the Research Advisory Committee (RAC) and Project Monitoring Committee (PMC) constituted by the Governing Body for monitoring R&D programs & projects of the Centre. The Centre is headed by the Director who is the principal executive officer.

The organization chart is as below:



**Vice Chairman
JNARDDC**



Sridhar Patra
CMD, NALCO

**Chairman
Research
Advisory
Council (RAC)**



Prof SP Mehrotra
IIT, Gandhinagar

**Chairman
Project
Monitoring
Committee
(PMC)**



Prof S Subramanian
IISc, Bangalore

**Director
JNARDDC**



Dr Anupam Agnihotri
JNARDDC, Nagpur

List of General Body Members: 2022-23

Chairman

Shri Vivek Bharadwaj, IAS

Secretary to the Government of India
Ministry of Mines, 3rd Floor, Shastri Bhavan
Dr. Rajendra Prasad Road, New Delhi - 110001

Members

- | | |
|---|---|
| <p>1. Shri Sridhar Patra
Vice Chairman, JNARDDC
Chairman-cum-Managing Director
National Aluminium Company Limited,
NALCO Bhawan, P/1, Nayapalli
Bhubaneswar - 751 013</p> | <p>7. Shri Satish Pai
Managing Director
HINDALCO Industries Limited
Aditya Birla Centre B-Wing
3rd Floor, SK Ahire Marg, Worli
Mumbai – 400030</p> |
| <p>2. Dr. Srivari Chandrasekhar
Secretary to the Govt of India,
Department of Science & Technology
Technology Bhavan, New Mehrauli Road
New Delhi - 110 016</p> | <p>8. Shri Abhijit Pati
Chief Executive Officer
Bharat Aluminium Company
Limited, BALCO Nagar
KORBA – 495684</p> |
| <p>3. Dr (Mrs) N Kalaiselvi
Director General, CSIR
Council of Scientific & Industrial Research
Anusandhan Bhawan 2, Rafi Marg
New Delhi - 110 001</p> | <p>9. Shri Sunil Gupta
Chief Executive Officer
VEDANTA Aluminium
Vill.: Bhurkamunda
Jharsuguda – 768 202, Odisha</p> |
| <p>4. Sanjay Lohiya, IAS
Additional Secretary to the Govt. of India,
Ministry of Mines,
3rdFloor, Shastri Bhavan
New Delhi - 110001</p> | <p>10. Chairman-Managing Director
Metallurgical & Engineering
Consultants (India) Limited,
Doranda
Ranchi - 834 002 (Jharkhand)</p> |
| <p>5. Shri Upendra C. Joshi, IRTS
Joint Secretary to the Govt of India,
Ministry of Mines
3rdFloor, Shastri Bhavan
New Delhi- 110001</p> | <p>11. Shri Abhay Bakre
Director General
Bureau of Energy Efficiency
Ministry of Power
New Delhi.</p> |
| <p>6. Ms. Nirupama Kotru, IRS
Financial Advisor to Government of India
Ministry of Mines
Shastri Bhavan
New Delhi - 110001</p> | <p>12. Dr Anupam Agnihotri
Director
Jawaharlal Nehru Aluminium
Research Development and
Design Centre Amravati Road,
Wadi, Nagpur- 440 023</p> |

List of Governing Body Members: 2022-23

Chairman

Shri Vivek Bharadwaj, IAS

Secretary to the Government of India
Ministry of Mines, 3rd Floor, Shastri Bhawan
Dr. Rajendra Prasad Road, New Delhi - 110001

Members

- | | |
|---|---|
| <p>1. Shri Sridhar Patra
Vice Chairman, JNARDDC
Chairman-cum-Managing Director
National Aluminium Company Limited,
NALCO Bhawan, P/1, Nayapalli
Bhubaneswar-751 013</p> | <p>8. Shri Abhay Bakre
Director General
Bureau of Energy Efficiency
Ministry of Power
4th Floor SewaBhawan, Sector-1
RK Puram, New Delhi-110066</p> |
| <p>2. Sanjay Lohiya, IAS
Additional Secretary to the Govt. of India,
Ministry of Mines,
3rd Floor, Shastri Bhawan
New Delhi - 110001</p> | <p>9. Dr R Balamuralikrishnan
Director
Defence Metallurgical Research
Laboratory, P.O. Kanchanbagh
Hyderabad- 500 058</p> |
| <p>3. Shri Upendra C. Joshi, IRTS
Joint Secretary to the Govt of India,
Ministry of Mines
3rd Floor, Shastri Bhawan
New Delhi- 110001</p> | <p>10. Prof S P Mehrotra
Indian Institute of Technology
Gandhinagar, Palaj Campus,
Gandhinagar, Ahmedabad – 382 424</p> |
| <p>4. Ms. Nirupama Kotru, IRS
Financial Advisor to Government of India
Ministry of Mines
Shastri Bhawan
New Delhi - 110001</p> | <p>11. Prof S Subramanian
Department of Materials Engineering
Indian Institute of Science
Bangalore – 560 012</p> |
| <p>5. Shri Abhijit Pati
Chief Executive Officer
Bharat Aluminium Company Limited
PO: BALCO Nagar KORBA – 495684
Chhattisgarh</p> | <p>12. Dr Prashant Gargava
Member Secretary, CPCB
Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi – 110 032</p> |
| <p>6. Shri Satish Pai
Managing Director
HINDALCO Industries Limited
Aditya Birla Centre B-Wing, 3rd Floor,
S.K. Ahire Marg, Worli, Mumbai – 400030</p> | <p>13. Dr Anupam Agnihotri
Director
Jawaharlal Nehru Aluminium Research
Development and Design Centre
Amravati Road, Wadi, Nagpur - 440023</p> |
| <p>7. Shri Sunil Gupta
Chief Executive Officer
VEDANTA Aluminium
Vill.: Bhurkamunda
Jharsuguda – 768 202, Odisha</p> | |

List of Research Advisory Committee :2022-23

Chairman

Prof. S.P. Mehrotra

Indian Institute of Technology, IIT Gandhinagar
Palaj Campus, Gandhinagar
Ahmedabad – 382 424 (Gujarat)

Members

- | | |
|---|---|
| <p>1. Prof S Subramanian
Department of Materials Engineering
Indian Institute of Science
IISc
Bangalore – 560 012</p> | <p>6. Shri Abhijit Pati
Chief Executive Officer
Bharat Aluminium Company Limited
PO: BALCO Nagar KORBA – 495684
Chhattisgarh</p> |
| <p>2. Dr Anita Agarwal
Head (TDT) / Advisor,
Department of Science & Technology,
Technology Bhavan, New Mehrauli Rd,
New Delhi- 110 016</p> | <p>7. Shri Satish Pai
Managing Director
HINDALCO Industries Limited
Aditya Birla Centre B-Wing
3rd Floor, S.K. AhireMarg, Worli
Mumbai – 400030</p> |
| <p>3. Shri M P Mishra
Director (P&T)
National Aluminium Company Limited,
NALCO Bhawan,
P/1, Nayapalli,
Bhubaneswar- 751 013</p> | <p>8. Shri Shailender K Sinha
Director (Exploration)
Odisha Mineral Exploration Corporation.
OMECL, 3rd floor, Bayan Bhawan, Unit-3,
Pandit Jawaharlal Nehru Marg
Bhubaneswar, 751001, Odisha</p> |
| <p>4. Shri Sunil Gupta
Chief Executive Officer
VEDANTA Aluminium
Vill.: Bhurkamunda
Jharsuguda – 768 202, Odisha</p> | <p>9. Dr BK Satpathy
Ex- ED (BD and R&D) , NALCO
Plot No. 803
Jaydev Vihar
Bhubaneswar- 751 013 Odisha</p> |
| <p>5. Mr S Nanda
Ex-Director, HCL &
Ex GM, NALCO
Bhubaneshwar</p> | <p>10. Dr Anupam Agnihotri
Director
Jawaharlal Nehru Aluminium Research
Development and Design Centre,
Amravati Road, Wadi, Nagpur- 440 023</p> |

List of Project Monitoring Committee: 2022-23

Chairman

Prof. S. Subramanian

Department of Materials Engineering
Indian Institute of Science (IISc), Bangalore – 560 012

Members

- | | |
|---|---|
| 1. Dr Anita Agarwal
Head (TDT) / Advisor,
Department of Science &
Technology, Technology
Bhavan, New Mehrauli Road,
New Delhi- 110 016 | 4. Dr. B.K. Satpathy
Ex- Executive Director, NALCO
Plot No. 803
Jaydev Vihar
Bhubaneswar- 751 013 Odisha |
| 2. Prof. D.R. Peshwe
Head, Department of
Metallurgical & Materials Engg.
VNIT, Nagpur – 440 010 | 5. Mr S Nanda
Ex-Director, HCL &
Ex GM, NALCO
Bhubaneshwar |
| 3. Shri M P Mishra
Director (P&T)
National Aluminium Company
Limited, NALCO Bhawan,
P/1, Nayapalli,
Bhubaneswar- 751 013 | 6. Dr. Anupam Agnihotri,
Director,
Jawaharlal Nehru Aluminium Research
Development and Design Centre
(JNARDDC)
Amravati Road, Wadi,
Nagpur- 440 023 |

Scientists and Staff as on 31.03.2023

Dr. Anupam Agnihotri, Director

Scientists: 15

Mr M T Nimje	Sr Principal Scientist	Dr Papparao Mondri	Scientist
Mr R N Chouhan	Sr Principal Scientist	Dr Priyanka Nayar	Scientist
Dr U Singh	Sr Principal Scientist	Mr Ramavajjala Anil Kumar	Junior Scientist
Dr Md Najar P A	Principal Scientist	Ms Prachiprava Pradhan	Junior Scientist
Dr (Mrs) S Rai	Principal Scientist	Mr Kola Immanuel Raju	Junior Scientist
Dr P G Bhukte	Principal Scientist	Ms Jyoti G Pendum	Junior Scientist
Mr VNSU V Ammu	Senior Scientist	Dr Anas N S	Junior Scientist
Mr V K Jha	Senior Scientist		

Scientific & Technical Supporting Staff: 18

Mr S K Thokal	Sr Scientific Officer Gr-II	Ms Shweta Naik	Scientific Asst II
Ms K Janbandhu	Sr Scientific Officer Gr-II	Mr Sandeep Kowe	Scientific Asst I
Mr N Warhadpande	Sr Scientific Officer Gr-II	Mr Suman Mukherjee	Scientific Asst I
Mr K J Kulkarni	Sr Scientific Officer Gr-I	Ms Sonali Thawrani	Scientific Asst I
Ms M Panchal	Scientific Officer	Mr P Manthena	Technical Asst III
Mr D R Meshram	Scientific Asst IV	Mr K B Gour	Technical Asst III
Mr A S Gijare	Scientific Asst IV	Mr V B Wankhede	Technical Asst III
Mr S Bagde	Scientific Asst II	Mr V Kshirsaut	Technical Asst III
Mr Gopal Daware	Scientific Asst II	Mr S Yadav	Technical Asst II
		Mr V P Naik	Technical Asst II

Administrative Staff: 12

Mr R Srinivasan	Sr Admin Officer	Mr N D Pethe	Personal Secy
Ms R Vishakha	Sr Admin Officer	Mr K Kishore	Sr Accountant
Mr S R Barhanpurkar	Personnel Officer	Mr Lalit Mohan	Sr Purch-Stores Asst
Mr G Bhaskar	AAO (Accounts)	Mr P Kshirsaut	Jr Asst
Mr R K Meshram	Personnel Officer	Mr Roshan Jasutkar	Jr Asst
Ms R Tembhurne	Personnel Officer	Mr Ravi Dhande	Jr Asst

Supporting Staff: 4

Mr Ashok J Hatwar	Driver-cum-Lab Attendant Sr Grade
Mr R C Patley	Driver-cum-Lab Attendant Sr Grade
Mr Raju Khobrgade	Driver-cum-Lab Attendant Grade- I
Mr Deochand S Thakare	Peon-cum-Messenger

Total Staff Strength: 50

New Equipments / Facilities

Sulphur Carbon Analyzer

Make: Leco

Model: SC 832

Detection: Sulphur and Carbon

Detection Limit:

For Carbon: 175 ppm to 20% per gram of sample

For Sulphur: 80 ppm to 3% per gram of sample

Application: To determine carbon and Sulphur content in Coal and Coke, Combustion Residues, Biomass Materials, Catalyst Materials, Cement, Soil and Ore Materials, Ceramics, Glass, Gypsum and Building Materials, Hydrated Lime and Cement, Fertilizer, Feeds and Plant Tissue Materials, Rubber, Resins and Polymers, Graphite, and Petroleum Products and Additives



Direct Mercury Analyzer

Make: Milestone

Model: DMA 80

Detection: Mercury (Hg)

Detection Limit: 0.0003 ng to 1500 ng (For solid liquid and gases)

Application: To determine Mercury (Hg) in rock, soil, sediment, ores, minerals, surface water, ground water, sea water, and other geological samples and industrial products.



TCLP Extractor

Make: Green Lab Equipment

Capacity: 8 bottles

The Toxicity Characteristic Leaching Procedure (TCLP) is a solid and waste sample extraction procedure for chemical analysis, employed to chemically determine if a waste is characteristically hazardous.



Thermogravimetric Analyzer

Make: Leco

Model: 801

Application: Thermogravimetric Analyzer determines weight loss, including moisture, ash, volatile content, and Loss-on-Ignition (LOI), in various organic, inorganic, and synthetic materials. Weight change is measured as a function of temperature as samples are exposed to a temperature program in an atmosphere-controlled environment. The multi-sample furnace design allows for simultaneous analysis of up to 19 samples.



Ultrapure water System

Make: MilliQ

Model: EQ 7000

Capacity: 10 litres/hrs

Resistivity: 18.2 MΩ.cm

TOC: < 10 ppb

Bacterial Count: < 10 CFU/ml

Ultrapure water (UPW) is water that has been purified to high levels of specification. As a standard, the water contains only H₂O, as well as balanced number of H⁺ and OH⁻ ions. To be classified as ultrapure, water must not contain any detectable endotoxins. This level of purity makes it a perfect reagent for laboratory work.





Moisture Analyzer

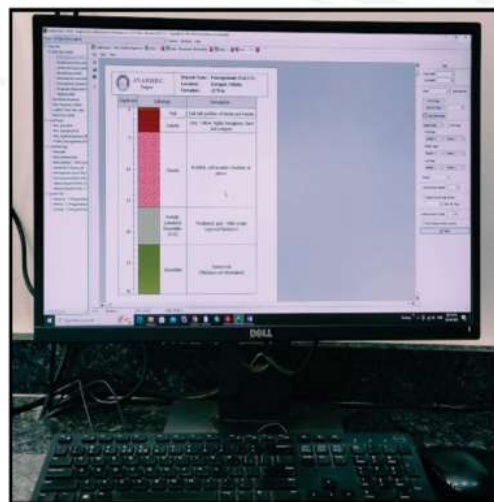
- Make : Mettler Toledo India Pvt. Ltd
- Model : HC103
- Temperature Range : 0 to 240°C
- Material : Minerals, ores, Rocks & other materials
- Size of Material : Powder upto 2 mm
- Minimum weight : 2 gm
- Maximum weight : 100 gm

Halogen Moisture analyzer is used for the determination of the moisture content in minerals, ores, rocks & other materials. It works along the lines of the thermogravimetric principle.

Log Plot Software

- Make : RockWare Incorporated Colorado USA
- Model : Log Plot 2022

JNARDDC has installed log plot software, an easy-to-use log plotting program with a flexible log layout. LogPlot has been widely used in the area of Geotechnical, Mining industries, Petroleum and Environmental industries. It is useful in preparation of Litholog of deposit with geological data (thickness, depth, remarks, deposit details, etc.) and analytical data.



ANNUAL ACCOUNTS

2022- 23



Jawaharlal Nehru Aluminium Research Development & Design Centre
Autonomous Body under Ministry of Mines, Govt. of India
Amravati Road, Wadi, Nagpur – 440023
www.jnarddc.gov.in

AUDITED BY



CA.RAJAT MODI



RAJAT MODI & CO.
CHARTERED ACCOUNTANTS
 502, Suryakiran Complex, Opp. VNIT Gate
 Abhyankar Nagar Square
 NAGPUR-440010
 Cell : 9370212220,7387186933
 E-mail : rajatmodica@gmail.com

REPORT OF AN AUDITOR RELATING TO ACCOUNTS AUDITED UNDER
 SUB-SECTION (2) OF SECTION 33 & 34 AND RULE 19 OF BOMBAY PUBLIC TRUST ACT.

Registration No. : F -6778 (NAGPUR)

Name of Public Trust : **JAWAHARLAL NEHRU ALUMINIUM RESEARCH
 DEVELOPMENT AND DESIGN CENTRE : NAGPUR**

(An Autonomous Body Under Ministry of Mines, GOI.)

Amravati Road Wadi, Opp. Wadi police station Nagpur

Post : Wadi (440 023)

For the year ending : **31st March 2023**

(a)	Whether accounts are maintained regularly and in accordance with the provisions of the Act and the rules	YES
(b)	Whether receipts and disbursements are properly and correctly shown in the accounts	YES
(c)	Whether the cash balance and voucher in the custody of the manager or trustee on the date of audit were in agreement with the account	YES
(d)	Whether all books, deeds, accounts, vouchers or other documents or record required by the auditor were produced before him	YES
(e)	Whether a register or movable and immovable properties is properly maintained, the changes therein are communicated from time to time to the regional office and the defects and inaccuracies mentioned in the previous audit report have been duly complied with	YES
(f)	Whether the Manager or trustee or any other person required by the auditor to appear before him did so and furnished the necessary information required by him	YES
(g)	Whether any property or funds of the Trust were applied for any object or purpose other than the object or purpose of the Trust	NO
(h)	The amount of outstanding for more than one year	YES
(i)	The amounts written off if any	NO
(j)	Whether tenders / quotation were invited for repairs or construction involving expenditure exceeds Rs.25,000/-	YES
(k)	Whether any money of the public trust has been invested contrary to the provisions of Section 35	NO
(l)	Alienations. If any, of the immovable property contrary to the provisions of Section 36 which have come to the notice of the auditor	NIL

**JAWAHARLAL NEHRU ALUMINUM
RESEARCH DEVELOPMENT & DESIGN CENTRE**

2022-23

(m)	All cases of irregular, illegal or improper expenditure, or failure or omission to recovery moneys or other property belonging to the public trust or of loss or waste of money or other property thereof, and whether such expenditure, failure, omission, loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustees or any other person while in the management of the trust.	NIL
(n)	Whether the budget has been filed in form provided by rule 16-A	YES
(o)	Whether the maximum and minimum number of the trustees is maintained	YES
(p)	Whether the meeting are held regularly as provided in such instrument	YES
(q)	Whether the minute of books of the proceedings of the meeting is maintained	YES
(r)	Whether any of the trustees has any interest in the investment of the trustees	NO
(s)	Whether any of the trustees is a debtor or creditor of the trust	NO
(t)	Whether the irregularities pointed out by the auditors in the accounts of the previous year have duly complied with by the trustees during the period of audit	YES
(u)	Any special matter which the auditor may think fit or necessary to bring to the notice of the Deputy or Assistant Charity Commissioner	NO

**For RAJAT MODI & CO.
Chartered Accountants**

**Place : NAGPUR
Date : 24.11.23**

**CA RAJAT MODI
PARTNER
Mem No. : 161252
FRN : 126024W**

CA.RAJAT MODI



RAJAT MODI & CO.
CHARTERED ACCOUNTANTS
 502, Suryakiran Complex, Opp. VNIT Gate
 Abhyankar Nagar Square
 NAGPUR-440010
 Cell : 9370212220,7387186933
 E-mail : rajatmodica@gmail.com

THE BOMBAY PUBLIC TRUSTS ACT 1950
SCHEDULE IX C

Statement of income liable to contribution for the year ending 31st March 2023
Name of Public Trust : Jawaharlal Nehru Aluminium Research Development
and Design Centre Nagpur.

Registration No. : F-6778 (NAGPUR)

		Rs.	Rs.
I	Income as shown in the Income and Expenditure Accounts : (Schedule IX)		27,46,64,593/-
II	Items not chargeable to contribution under sec.58 and Rule 32 :		
	I.) Donations received from other Public Trusts and Dharmaday	NIL	
	ii) Grants Received from Government & Local Authorities	11,55,26,672	
	iii) Interest on Sinking or Depreciation Fund	NIL,	
	iv) Amount spent for the purpose of secular education	NIL	
	v) Amount spent for the purpose of Medical relief	NIL	
	vi) Amount spent for the purpose of veterinary treatment of Animals	NIL	
	vii) Expenditure incurred from donation for relief of distress Caused by scarcity, drought, flood, fire or other natural Calamity	NIL	
	viii) Deductions out of income from lands used for Agricultural purposes:	NIL	
	(a) Land Revenue local Fund Cess	NIL	
	(b) Rent Payable to superior land lord	NIL	
	(c) Cost of production, if lands are cultivated by Trustee	NIL	

JAWAHARLAL NEHRU ALUMINIUM RESEARCH
DEVELOPMENT & DESIGN CENTRE ,NAGPUR

(F Y : 2022-23)

ix). Deductions out of income from lands used for non Agricultural purposes :	NIL	
(a) Assessment, Cess and other Government or Municipal Taxes, Land tax etc	80,620/-	
(b) Ground rent payable to the superior landlord	NIL	
(c) Insurance Premium	NIL	
(d) Repairs at 10 percent of gross rent of building	NIL	
(e) Cost of collection 4 percent of gross rent of building let out	Nil	
(x) Cost of collection of income or receipts from Securities, stocks etc. At 1 percent of such income	NIL	
(xi) Deductions on account of repairs in respect of building not rented and yielding no income at 10 percent of the estimated	NIL	
Gross Annual Income Chargeable to advance Contribution (Payable to Dy Charity Commissioner)		15,91,37,921

Certified that while claiming deductions admissible under the above schedule, the Trust has not claimed any amount twice, either wholly or partly, against any of the items mentioned in the Schedule which have the effect of double deductions.

For RAJAT MODI & CO.
Chartered Accountants

Place : NAGPUR
Date : 24.11.23

CA RAJAT MODI
PARTNER
Mem No. : 161252
FRN : 126024W

CA.RAJAT MODI



RAJAT MODI & CO.
CHARTERED ACCOUNTANTS
 502, Suryakiran Complex, Opp. VNIT Gate
 Abhyankar Nagar Square
 NAGPUR-440010
 Cell : 9370212220,7387186933
 E-mail : rajatmodica@gmail.com

NAME OF THE PUBLIC TRUST:
**JAWAHARLAL NEHRU ALUMINIUM RESEARCH DEVELOPMENT &
 DESIGN CENTRE NAGPUR**
 (Autonomous Body under Ministry of Mines, Govt of India)
 Reg No. F -6778 (NAGPUR)
 As On 31.03.2023

"SCHEDULE IX-D"

[See Rule 19 (2A)]

Information to be submitted by the Auditor along with Audit Report under sub-section (1) of section 34 of the Maharashtra Public Trust Act.

SN	Particulars	Details		
1	PAN No. of Trust	AAATJ2814M		
2	Registration No. with Date of Registration u/s 12AA of Income Tax Act, 1961 (43 of 1961)	CIT- IV 12A / P-217/P-2007-08 dated 22.11.2007		
3	Acknowledgement No. With Date of filing of the Return of Income for Earlier Three Years	Sr. No.	Acknowledgement No.	AY Year
		1	326618991310321	AY 2020-21
		2	350879980140322	AY 2021-22
		3	78620966001122	AY 2022-23
4	PAN of All Trustees	Sr. No.	Name Of Trustee	PAN No.
		1	Dr Anupam Agnihotri (Director)	ABCPA8526E
		2	R Srinivasan (Secretary)	AQIPS8639P
		3	All others are Ex-Officio	-

For RAJAT MODI & CO.
Chartered Accountants
CA RAJAT MODI
PARTNER
 Mem No. : 161252
 FRN : 126024W

Place : NAGPUR
 Date : 24.11.23

SCHEDULE-A

RENT AND OTHER DEPOSITS(2022-23)

Previous year	PARTICULARS (Liability)	(Amt. in ₹)
26740953	Earnest Money Deposit	13565867
185823	Rajesh S Badkhal	199669
307603	Media Elevators & Engg Co.	227867
387346	Mayur Services	428697
1127322	Ganga Security	330058
2950000	SMS India Pvt Ltd	2950000
830610	Sameer Ghadge	830610
4425	Phoenix Power Nagpur	4425
18750	Masibus Automotion Gujrat	18750
290265	Orbit Technology Pvt ltd Hyderabad	390265
2291400	Thermo Fisher Mumbai	2291400
315000	Kinc Mineral Technology	315000
735926	Naskar & Company	735926
1277350	Greenspace Corporation Nagpur	0
1561905	Matrix Trade Link Pvt Tld	49200
517523	The A C C Limited	0
0	DHR Holding India Pvt Ltd	3272800
0	Mitutoya South Asia Pvt Ltd	2957400
0	MD Minerals Tech Pvt Ltd	2112308
0	Instron USA	4600000
0	Chhattisgarh Council of Science Raipur	660800
0	Unique Automation Nagpur	63000
39542201	SUB TOTAL (1)	36004042

SUNDRY CREDITORS / OTHER LIABILITIES

SCHEDULE-B

Previous year	PARTICULARS	(Amt. in ₹)
50000	Audit Fees payable	25000
27302039	Outstanding Liabilities (ANNEXURE A-1)	44820543
680462	Employees EPF contribution	1990
1352409	TDS As per 26 AS deducted by Various Parties	8300398
0	Star Health claim payable to staff	6800
29384910	SUB TOTAL (2)	53154732
6,89,27,111	GRAND TOTAL(1+2)	8,91,58,774

Annexure : B-1

OUTSTANDING LIABILITIES AS ON 31/3/2023

Previous year	PARTICULARS	(Amt. in ₹)
74247	Water charges bill	18399
190346	Rajesh S Badkhal for Gardening contract	212768
196292	Media Elevator co ltd for Elect contract	206274
9759	Telephone charges	11238
410408	Mayur Service Housekeeping Contract	476324
331901	Electricity charges	553321
633648	Ganga Security services	593632
26221000	The Trust Group Gratuity JNARDDC A/c	36292928
670973	Employer's contribution to EPF	0
19000	Lanwin It Solution	0
(1455535)	G S T	6455659
2,73,02,039	Total Outstanding Liabilities	4,48,20,543

ANNEXURE 'C' OF FIXED ASSETS ATTACHED TO & FORMING PART OF BALANCE SHEET AS AT 31ST MARCH-2023													
SCHEDULE - C													
(Amt. in ₹)													
Particulars	Rate of Dep %	Gross Block		Depreciation			Net Block						
		Cost as at 01.04.2022	Additions upto 31.03.2023	Deletions 31.3.2023	Adjustments 31.3.2023	Cost as at 31.03.2023	Dep. as at 01.04.2022	Dep for the year upto 31.3.2023	Dep on sold items	Adjustments	Cost as at 31.03.2023	Cost as at 31.03.2022	
Immovable properties													
Technical Buildings	3.34	51991705	0	0	51991705	47230184	1736523	0	48966707	0	3024998	4761521	
Office Buildings	1.63	15044525	0	0	15044525	6897232	245226	0	7142458	0	7902067	8147293	
Land		2615177	0	0	2615177	0	0	0	0	0	2615177	2615177	
Fire Fighting System	4.75	1270062	0	0	1270062	1270062	0	0	1270062	0	0	0	
Electrical Installation	3.34	21812357	0	0	21812357	19657956	728533	0	20386489	0	1425868	2154401	
Residential Buildings	1.63	31442316	0	0	31442316	12722914	512510	0	13235424	0	18206892	18719402	
Large Scale Alumina Lab	4.75	6949295	0	0	6949295	6949295	0	0	6949295	0	0	0	
Air Conditioning	4.75	5082690	0	0	5082690	4651936	241428	0	4893364	0	189326	430754	
Sub Total-I		136208127	0	0	136208127	99379579	3464220	0	102843799	0	33364328	36828548	
Previous Year		136172378	0	0	136172378	95915359	3462522	0	95915359	0	40257019	40257019	
Movable Properties													
Motor Vehicles	11.31	5551497	0	0	5551497	5551497	0	0	5551497	0	0	0	
Furnitures and Fixtures	6.33	5313197	0	0	5313197	5313197	0	0	5313197	0	0	0	
Office Equipments	4.75	2533985	0	0	2533985	2408060	7535	0	2415595	0	118390	125925	
Telecommunication system	4.75	2021667	0	0	2021667	1879092	96029	0	1975121	0	46546	142575	
Books and Periodicals	100	5274469	0	0	5274469	5274469	0	0	5274469	0	0	0	
Lab Equipments Installed	4.75	144017447	0	0	144017447	129043603	6840829	0	135884432	0	8133015	14973844	
Lab equip S & T (Govt Grants)	4.75	63158801	28150117	0	91308918	10782091	4337174	0	15119265	0	76189653	52376710	
Lab Equip (Nalco Capital)	4.75	21601319	0	0	21601319	9966459	1026063	0	10992522	0	10608797	11634860	
Lab Equip (Modrobs)	4.75	18772746	0	0	18772746	11249224	891705	0	12140929	0	6631817	7523522	
Lab equipment under (Govt Grant)	4.75	10579406	0	0	10579406	24521735	5024522	0	29546257	0	76233149	81257671	
Lab equipment DST P-55	4.75	4460171	0	0	4460171	1059290	211858	0	1271148	0	3189023	3400681	
Lab Equipments not Installed		13546905	12726508	0	13546905	12726508	0	0	0	0	12726508	13546905	
Computers	16.21	6210502	0	0	6210502	6210502	0	0	6210502	0	0	0	
Technical research equip (UNDP)	4.75	70484011	0	0	70484011	70484011	0	0	70484011	0	0	0	
Sub Total-II		468726122	40876625	0	49055842	283743230	18435715	0	302178945	0	193876998	18492893	
Previous Year		440747578	27050544	0	440747578	266566915	16425470	0	266566915	0	174180664	174180664	
Grand Total (Sub Total I+II)		604934249	40876625	0	632263969	383122809	21899935	0	405022744	0	227241226	221811441	

SCHEDULE : D- 1/2

F Y 2022-2023		
PRE YEAR	PARTICULARS	(Amt. in ₹)
	1. SUNDRY DEBTORS	
(266773)	National Aluminium co Ltd	658123
899768	M E C L Nagpur	1060089
146945	NEERI	30817
(48100)	Ceraflux India Pvt Ltd	(22140)
19391000	Ministry of Mines (AMDF Fund) receivable	0
(86262)	Vedanta Alu & Power Jharsugda SEZ	0
73596	Bry Air Asia Pvt Ltd	93996
522858	Nalco Angul/Damajjod Testing	0
8850	Phonix Amalgams Pvt Ltd	8850
1500	Hindalco Industries Ltd Belgavi/Lapanga etc	513536
2950	Castwel Industries	(8555)
(12911)	MPM Durrs Refracoat Pvt Ltd	31394
(6860)	Calderys India Refractories Ltd	8040
10325	Brisil Technologies Pvt Ltd	11800
3288	Hindalco Industries Ltd Sambalpur	0
0	Gujrat Credo Alumina Chemical Ltd Katch	3430
(888024)	Received from other party coal sample etc	(1818750)
20191	Carborundum Universal Ltd kerla	37211
0	Unijules Life Sciences Ltd	(1180)
30682	M S P G C Ltd Bhusawal	30682
21240	CSRI Adv MPRI Bhopal	21240
2952904	Odisha M E Corp Ltd Bhubaneswar	775967
12508	Jindal Steel and and power limited	1060
18762	NTPC Limited Moudha	0
(25960)	SLM Metal Pvt Ltd	(3760)
307410	Thriveni Earthmovers Pvt Ltd	133622
4662180	G S I Hyderabad	4791400
97350	MOIL Limited	82770
7570083	Receivable from coal Sample testing	30569546
0	Receivable amt from CTSC Invoice bill	700445
3,54,19,500	(Total ' 1 ')	3,77,09,633

(2022-2023)

SCHEDULE D- 2/2

2). INVENTORIES

69302	STORES(Closing Stock)	138671
--------------	------------------------	---------------

PRE YEAR	PARTICULARS	(Amt. in ₹)
80019	3. Departmental Advances (Annx D-3)	375448

PRE YEAR	4. (Advances/ Deposit)	(Amt. in ₹)
109000	Telephone Deposit	109000
315000	Deposit with MSEB	315000
102410	Deposit with M.S.Water Board	102410
12455913	TDS Amt receivables From I tax office	24178479
1157603	Deposit with MSEB for new Connection	1157603
61750	Adv to Unique Automation Nagpur	630000
197297	Adv to JEOL Ltd	197297
96500	Adv to Mohil Chordia Nagpur	96500
1546294	Prepaid expenses	1756889
49400	Adv to B M Ghawade & Associated Nagpur	0
0	Adv to Anna University	308746
0	Adv to TCI Freight	4000
0	Adv to Dhruvi Creation	(29500)
0	Adv to Sterling Education	(320339)
1,60,91,167	(TOTAL-4)	2,85,06,084
5,16,59,987	(Total 1 + 2 + 3 + 4) :	6,67,29,836

Annexure 'D-3' TO SCHEDULE : D : 2022-23

SCHEDULE D-3

PRE YEAR	PARTICULARS	Current
Amount		Year Amt
	1: DEPARTMENTAL ADVANCES- EMPLOYEES	(Amt. in ₹)
0	Upendra Singh	26000
55800	Vimal Kishore Jha	0
0	TA Adv Project staff	6698
0	Prabhakar Hedaoo	7750
9800	K Kishore	0
14419	Phiroze Dungore	0
0	Suchita Rai	335000
80019	Total	375448

Breakup Schedule-D

35419500	1. Sundry Debtors	37709633
69302	2. Stores (Closing Stock)	138671
80019	3. Departmental Advances (Ann: D-3)	375448
16091167	4. Advances / Deposit	28506084
5,16,59,987	Grand Total SCH-D	6,67,29,836

SCHEDULE-E

5). CASH & BANK BALANCES
F.Y. 2022-2023

PRE YEAR	PARTICULARS	(Amt. in ₹)
501723	SBI Chhaoni Nagpur	0
922304	I D B I Bank Nagpur (392)	112611
9136	Axis Bank, Nagpur	9136
131054	YES Bank, Nagpur (764)	425737
382621	IDBI Online A/c No (4688)	767499
90041	State Bank of India Ravinagar, Nagpur	271811
20,36,880	Total	15,86,794

CA.RAJAT MODI



RAJAT MODI & CO.
CHARTERED ACCOUNTANTS
 502, Suryakiran Complex, Opp. VNIT Gate
 Abhyankar Nagar Square
 NAGPUR-440010
 Cell : 9370212220,7387186933
 E-mail : rajatmodica@gmail.com

**JAWAHARLAL NEHRU ALUMINIUM RESEARCH DEVELOPMENT
 AND DESIGN CENTRE: NAGPUR**

SIGNIFICANT ACCOUNTING POLICIES AND NOTES ON ACCOUNTS
 ATTACHED TO BALANCE SHEET AS ON 31ST MARCH, 2023

PART A: SIGNIFICANT ACCOUNTING POLICIES

1. The Centre is following Mercantile System of Accounting
2. Depreciation is provided on assets put to use, on Straight Line Method as per the rates specified under the Companies Act, 1956.
3. Fixed Assets are stated at cost of acquisition, inclusive of freight, Octroi, Duties and taxes and incidental expenses related to the acquisition.

PART B: NOTES ON ACCOUNTS

1. The Centre being established as an R & D Centre is not self-sufficient. The expenditure over and above the income generated is bridged by the Revenue Grant provided by the Government of India. The depreciation on assets put into use is not reimbursed in the Revenue Grant.
2. The excess of income over expenditure amounting to ₹ 7,55,54,521/- has been carried over as surplus to Balance Sheet and set off against the accumulated loss / deficit of earlier years.
3. Since this is a trust with registration under section 12(A)(a) of IT Act-1961, Income tax is not payable.
4. Previous year figures have been regrouped wherever necessary.
5. Salary & Projects grants are released by Ministry of Mines, Govt of India on Quarterly basis normally. Thus, the Centre utilizes the available funds/ Grants (which is received for specific purposes) on temporary basis to meet the various committed expenditure which are recouped later on receipt of the allocated budget.

**For RAJAT MODI & Co
 Chartered Accountants**

**For Jawaharlal Nehru Aluminium Research Development
 & Design Centre, Nagpur**

(CA Rajat Modi)
Partner
 Member No. 161252
 F.R.No. 126024W

(R SRINIVASAN)
Secretary cum Sr Admin Officer

(ANUPAM AGNIHOTRI)
Director

(V.L. KANTHA RAO)
Chairman

THE BOMBAY PUBLIC TRUST ACT-1950
SCHEDULE IX (WIDE RULE (17(11))
NAME OF THE PUBLIC TRUST: JAWAHARLAL NEHRU ALUMINIUM RESEARCH DEVELOPMENT & DESIGN CENTRE NAGPUR (Autonomous Body under Ministry of Mines, Govt of India)

Income and Expenditure Account for the year ending 31.03.2023 [2022-23]

EXPENDITURE	SCH	AMOUNT	AMOUNT	INCOME	SCH	AMOUNT	AMOUNT
To Expenditure in respect of properties :-							
Rate, Tax, Cess		80620		By Rent (Accrued)		0	0
Repairs and maintenance	F	2313217		(realized)		0	0
Salaries	G	131722323		By Interest (Accrued)		0	0
Insurance		157373					
Depreciation		21899935		Interest on FDR		4946770	
Other Expenses	H	7033306	163206774	Interest Received on SB A/c		0	4946770
To Audit Fees / Expenses		25000					
To Printing & Stationery Expenses		53091		On securities		0	
To Postage & courier charges		46859		On Loans		0	
To Project expenses	I	35272061		On Bank account		0	0
To Travelling Expenses		257005	35654016				
To Provision for Audit Fees & IT return fees				By Dividend			0
To Miscellaneous Expenses	J	249282	249282	By Donations in cash or kind			0
To Depreciation		0	0				
To Amount transferred to Reserve or specific funds.		0	0	By Donation from Trustees			0
				By Grants	K	115526672	115526672
To Expenditure on object of the Trust :-							
a. Religious		0					
b. Educational		0		By Income from other sources			
c. Medical Relief		0		Technical Testing Fee		145035440	
d. Relief of poverty		0		Income from Research Projects	L	6786400	
e. Other Charitable objects		0		Miscellaneous Receipts	M	893189	
		0		Technical Seminars / Training			
		0		Program Receipts	N	1476122	
				Prior Period Income : S/ Debtor		0	
				By Amount Written off		0	
EXCESS OF INCOME OVER EXPENDITURE CARRIED OVER TO BALANCE SHEET		75554521	7,55,54,521	By Contribution For Visit		0	15,41,91,151
TOTAL			27,46,64,593	TOTAL			27,46,64,593

AS PER OUR REPORT OF EVEN DATE ATTACHED
FOR RAJAT MODI & CO
C.A. RAJAT MODI
PARTNER
Member No. 161252 FRN-126024W

For Jawaharlal Nehru Aluminium Research Development & Design Centre.
V.L. KANTHA RAO
CHAIRMAN

R SRINIVASAN
SECRETARY CUM SR ADMIN OFFICER

(F.Y.2022-2023)		SCHEDULE- F
PRE YEAR	REPAIRS AND MAINTENANCE	(Amt. in ₹)
31855	Township	1969849
20322	Electrical Works	28800
452901	Office building /Technical complex	155910
120122	Office Vehicles	158658
169000	Land Survey	0
7,94,200	GRAND TOTAL (REPAIR & MAINT)	23,13,217

SCHEDULE- G		
PRE Year	PARTICULARS SALARY COMPONENT(2022-2023)	(Amt. in ₹)
75120875	Salary and Allowances	74730503
891000	Children Education Allowance (CEA)	810000
13500000	Gratuity Contribution to LIC	11880694
131252	Staff Bonus	143342
1706101	Medical Reimbursement	2684667
7511307	Employer's Contribution to EPF	7562999
1326859	Leave Encashment	8261202
285914	Administrative charges on EPF	315480
45225	Employer's Contribution to EDLI	45107
900316	Group Insurance scheme (GIS)	831779
770577	LTC expenses	1692327
828868	Travelling Expenses	2274353
2289651	Salary / wages paid to Electrical contract staff	2508888
4846871	Salary / wages paid to Office boys/Peons contract staff	5409991
2281482	Salary / wages paid to office & Campus Maint contract staff	2503046
7371883	Salary / wages paid to Security Services contract staff	7909898
193210	Salary paid to Consultant (Admin / Stores)	0
1395135	Salary paid to Consultant (Technical)	1111880
300000	Salary paid to Lab Asst. (Contractual)	290867
635506	Salary Scientific Asst-II (Contractual)	0
783504	Salary (Administrative IT/Lib.)	755300
108387	Extrusion press op & Maint.	0
12,32,23,923	Total Exp	13,17,22,323

F.Y : 2022-23

SCHEDULE-H

PREVIOUS YEAR	PARTICULARS	(Amt. in ₹)
	ESTABLISHMENT EXPENSES	
142177	Telephone / Fax charges	115949
39429	Internet/ Broadband charges	54888
142129	Office Expenses	110784
8867	Subscription to Periodicals	6080
76700	Legal Expenses	495718
588853	Seminars and Conferences	1000324
235292	Staff Canteen / welfare exp.	181547
13849	Advertisement	7750
40212	Meeting expenses	57521
79411	Computer Stationery/Consumable /Anti-Virus Kit	12151
261736	Republic / Independence day / Foundation day / AKAM	71737
26393	Hindi Program exp	18061
5987	Library & Information Expenses	1144
10758	Bank Charges	11719
80750	Professional fees (CA) for ITAX, GST work etc	156250
0	Tender Cost	11800
98165	Recruitment exp	34923
18,50,708	TOTAL (Establishment Exp)	23,48,345

40,32,978	UTILITY EXPENSES	46,84,961
------------------	-------------------------	------------------

58,83,686	GRAND TOTAL (Other Exp) Schedule-H	70,33,306
------------------	---	------------------

Year	Schedule of expenses shown in I & E A/c(Schedule-IX)	AMOUNT
25000	Audit Expenses	25000
145343	Printing & Stationery	53091
72234	Postage & Courier charges	46859
203824	Fuel and Oils (Vehicle)	257005
80620	Rent, Rates and Taxes	80620
143309	Insurance	157373
6,70,330	TOTAL	6,19,948

FY : 2022-2023		SCHEDULE - I
PRE YEAR	PROJECT EXPENSES	(Amt. in ₹)
480000	S-18 Staff -Super Thermal Al. Conductor Devp (SSAG)	0
0	S-21 Synergistic Utilization of al waste (SSAG)	34200
201441	S-26 Fabrication of Ceramic nano coatings-automotive (SSAG)	0
442313	S-29 Al scrap recycling (SSAG)	1299739
2247508	S-31 Bench scale study of AlF ₃ extraction CFA (SSAG)	1520302
188342	S-32 Digestion Efficiency project (SSAG)	413473
3962392	S-33 Dross Utilisation Bench Scale (SSAG)	2077748
3429528	S-34 CRMS for Analysis of Aluminium Alloys (SSAG)	3964683
0	S-35 Geo-Tech. Evaluation of Bauxite and Laterite (SSAG)	2808681
0	S-36 Solid state recycling of aluminium chips(waste) (SSAG)	1199196
0	S-37 Tech. Dev. for Holistic Utilization of Red Mud (SSAG)	2256328
0	S-38 Red mud valorization; achieve zero waste: X-Ray (SSAG)	2024166
0	S-39 Dev of medium strength alloy (SSAG)	1852867
0	S-40 Un-diluted Recycling of cast Aluminium Alloys(SSAG)	719722
0	S-41 Production of Onyx grade ATH (SSAG)	1338373
0	S-42 Fabrication of Al ₂ O ₃ containing cellulose (SSAG)	138890
0	S-43 Techno Economic survey: Copper recy. industry (SSAG)	832485
0	S-44 Techno Economic survey: Lead recy. industry (SSAG)	447507
0	S-45 Techno Economic survey: Zinc recycling industry (SSAG)	398627
0	N-42 NALCO Utilization of PLK project	198813
72256	N-45 NALCO Devp of ceramic Proppant from PLK	0
562802	N-46 Iron values from Red Mud	69832
4152358	N-47 Devp of Process for 4N HPA and sub-strate making	342535
111691	N-48 Dev. of DC Cast Al Alloy for Yoke in Automobile	868551
37153	N-49 SPL Nalco Project	1911342
472000	P-56 Characterization study (Hi Tech Meta Raipur)	0
250437	P-60 3N Pure alumina LED(DST)	0
846961	P-61 DST Instrument for Measurement Realtime Anode	1761821
1453420	P-62 DST Instrument for Instantaneous on stie Measurement	5048820
23224	P-64 Instrument for Instantaneous Balco Project	181741
271846	MECL Nagpur Testing / Coal testing work exp	1104937
2403687	DPR / S&T grant CAPEX expenses	167136
105132	NABL Certification	22395
0	Nalco Training Program	267152
2,17,14,491	TOTAL (Project Exp)	3,52,72,061

LAB OPERATIONAL EXP (2022-2023)		SCHEDULE - J
PRE YEAR	PARTICULARS	AMOUNT
50281	Lab Operational & Consumables / Spares	30132
195000	AMC Computers	190000
19200	AMC CCTV Camara	29150
344485	Prior period expenses	0
6,08,966	TOTAL	2,49,282

F Y: 2022-2023

SCHEDULE - K

GOVERNMENT GRANTS

PRE YEAR	PARTICULARS	AMOUNT
6008000	GOVT REVENUE GRANT FROM AMDF	0
74000000	GOVT SALARY GRANT	76000000
8,00,08,000	Sub Total-1	7,60,00,000
	Ministry of Mines Govt. Grants for Science & Technology Projects	
480000	S-18 STAL Super thermal al conductor (SSAG)	0
0	S-21 Synergistic Utilization of al waste (SSAG)	32694
0	S-29 Techno Eco Survey of Al Scrap (SSAG)	535500
0	S-31 Bench scale study of Al ₃ extraction from CFA (SSAG)	1151000
0	S-32 Digestion efficiency bauxite size fraction (SSAG)	411000
0	S-33 Dross Utilization Bench Scale (SSAG)	2214000
0	S-34 CRM's Analysis of Aluminium Alloy (SSAG)	3529000
2730800	S-35 Geo-Tech. Evaluation of CG Bauxite & Laterite (SSAG)	0
3724700	S-36 Solid state recycling of aluminium chips(waste) (SSAG)	0
2097800	S-37 Tech. Dev. for Holistic Utilization of Red Mud (SSAG)	0
1638937	S-38 Red mud valorization; achieve zero waste: X-Ray (SSAG)	356563
0	S-39 Dev of medium strength alloy (SSAG)	3198500
0	S-40 Un-diluted Recycling of cast Aluminium Alloys (SSAG)	1843750
0	S-41 Production of Onyx grade ATH (SSAG)	2970900
0	S-42 Fabrication of Al ₂ O ₃ containing cellulose (SSAG)	655725
0	S-43 Techno Economic survey: Copper recy. industry (SSAG)	5159700
0	S-44 Techno Economic survey: Lead recy. industry (SSAG)	5254200
0	S-45 Techno Economic survey: Zinc recy. industry (SSAG)	4868640
0	S-46 Devp. of low cost filler using Lithomargic clay (SSAG)	2690500
0	S-47 Devp. of prototype aluminium seat frame (SSAG)	3655000
500000	IEC Govt Grant for Seminar (ICNFM)	1000000
11172237	Sub Total-2	39526672
9,11,80,237	Grand Total 1+2	11,55,26,672

F.Y- 2022-2023		SCHEDULE- L
PRE YEAR	PARTICULARS	(Amt. in ₹)
	B) Other Research Projects	
0	N-46 NALCO Recovery of iron values from red mud	2570400
2626000	N-48 NALCO Dev. DC Cast Al Alloy for Yoke in Automobile	0
3608400	N-49 NALCO Liming study of use of 1st cut SPL	0
1147000	P-63 VEDANTA Holistic Utilization of Red Mud	339000
1147000	P-63 HINDALCO Holistic Utilization of Red Mud	339000
109000	P-63 NALCO Holistic Utilization of Red Mud	1038000
0	P-64 BALCO Instrument for Onsite bath measurement	2500000
500000	Process for delamination of packaging (Shakti Plastic)	0
91,37,400	TOTAL (Income from Research Projects)	67,86,400

Miscellaneous Receipts		SCHEDULE-M
PRE YEAR	PARTICULARS	(Amt. in ₹)
12387	Misc. Receipts	190184
80150	Licence fees and water charges	91397
277529	Guest house/ Qtr. rent / charges received	252981
5000	Vendor registration fees	6000
36658	Sale of store materials/ unserviceable	332777
58323	Liquidated damages (LD)	14350
57495	Prior period income: S/ Creditors not payable	0
39755	Prior period income collected from S/ Debtors	0
195510	Application fees	5500
7,62,808	TOTAL (Miscellaneous Receipts)	8,93,189

Program Receipts : Technical Seminar/Training Program		SCHEDULE - N
PRE YEAR	PARTICULARS	(Amt. in ₹)
80000	Seminar on Aluminium Extrusion	0
0	Seminar ICSOBA	121122
0	Seminar on ICNFM-2022	200000
0	Nalco staff Training Program at JNARDDC	1155000
80,000	Total (Program Receipts)	14,76,122

75
Azadi Ka
Amrit Mahotsav



34 years of commendable service to the aluminium industry



**Jawaharlal Nehru Aluminium
Research Development &
Design Centre,
Autonomous Body
(Ministry of Mines), Gol,
Opp. Wadi Police Station
Amravati Road, Wadi,
Nagpur-440023
07104-220701
www.jnarddc.gov.in**