WITH THE BEST COMPLIMENTS OF

Andhra Cement Co. Ltd., Vijayawada

PIONEERS IN MANUFACTURER OF SPONGE IRON

IN COLLABORATION WITH NML
“Success comes to those who dare and act; it seldom goes to the timid” — Jawaharlal Nehru.

“A nation’s strength ultimately consists in what it can do on its own and not in what it can borrow from others” — Indira Gandhi.
Late Shri Jawaharlal Nehru, Former Prime Minister and President of Council of Scientific and Industrial Research

Late Dr. S. S. Bhatnagar, Founder of Council of Scientific and Industrial Research and its first Director-General

Late Sir Jehangir Ghandy, Former Chairman, Planning Committee of NML and Chairman, NML Executive Council
I am glad to know that the National Metallurgical Laboratory, Jamshedpur, will celebrate its Silver Jubilee shortly. On this happy occasion I send my felicitations to all those associated with this laboratory and wish it continued progress and prosperity in the years to come.
I am glad to know that the National Metallurgical Laboratory, Jamshedpur, will celebrate its Silver Jubilee in November, 1975. The Laboratory was established to foster applied and fundamental research and development work on Metallurgical and allied subjects on an organised basis. It is gratifying to note the progress it has made during the twenty five years of its existence. I wish the Laboratory continued success in its endeavours to serve the mineral and metal based industries in the country. I send my best wishes for the success of the Silver Jubilee Celebrations.

(B.D. Jatt1)
MESSAGE

Ancient India's metallurgical skills were world renowned. But feudalism and foreign rule prevented us from taking advantage of the Industrial Revolution and the discoveries of modern science. Only in the last three decades could we shape our own destiny. Our programme of economic regeneration assigns a crucial role to the development of our mineral resources. Through its fundamental and applied research, the National Metallurgical Laboratory has made a significant contribution to the building up of key industries and to the attainment of technological self-reliance.

I am glad to know that the Laboratory is completing twenty-five years this November. My good wishes for its further success.

(Indira Gandhi)

New Delhi,
July 15, 1975.
MESSAGE

It is heartening to know that the National Metallurgical Laboratory, Jamshedpur, will be completing its 25 years of existence on the 14th November, this year. This Laboratory has made commendable progress in various fields of metallurgical science and technology. For economic progress of a country, scientific and technological developments are essential. This National Laboratory, which had the privilege of being formally inaugurated by the Prime Minister of India Late Pandit Jawaharlal Nehru, is successfully steering under the able guidance of its present Director.

This National Laboratory fully deserves to celebrate its Silver Jubilee, and I convey my best wishes for its grand success.
MESSAGE.

It gives me pleasure to send my greetings to the National Metallurgical Laboratory, Jamshedpur on the occasion of its Silver Jubilee Celebrations. This laboratory has made significant contributions towards the growth of metallurgical industry in the country by fostering research and offering solutions to many technological problems. I hope, this laboratory will grow from strength to strength in the days to come and serve metallurgical research in still more effective way.

(Jagannath Mishra)
Chief Minister, Bihar.
2. 8. 75
MESSAGE

I am glad to learn that the National Metallurgical Laboratory will be celebrating its Silver Jubilee in November this year. It is significant that this year the industries are seeking to utilise the sponge iron technology developed by this laboratory. With increasing demands for development and modification of technology to suit Indian conditions, I am sure the National Metallurgical Laboratory will be increasingly called upon by industries to come to their assistance. My greetings and best wishes go to the Director and his band of scientists on the occasion of the Silver Jubilee.

(P. N. Haksar)
Message

India is rich in mineral and metal resources, both in variety and availability. The National Metallurgical Laboratory, Jamshedpur, founded 25 years ago to generate appropriate technology and aid the industrial and economic growth, has earned for itself the affection and trust from the industry, through its technical competence and contributions in metallurgical and allied subjects.

Among its several significant achievements are the beneficiation of low grade ores and minerals, production of ferro-alloys, aluminium alloys, utilisation of metallurgical wastes and more recently the development of technology for the production of sponge-iron.

NML has come of age, making its impact felt, on the economic and industrial growth, serving the industry and the country at its best. On the occasion of the Silver Jubilee of the NML, CSIR family joins me to offer our very warm felicitations to the Director, scientists and other colleagues and wish them continued successes in their endeavour.

(Y. Nayudamma)
DIRECTOR-GENERAL
CSIR
Directors & Scientists-in-Charge of The National Metallurgical Laboratory

Mr. E. H. Bucknall
Director (1953-1956)

Dr. B. R. Nijhawan
Director (1956-1966)

Prof. V. A. Altekar
Director (Since August 1969)

Directors previous to 1953
Late Dr. G. Sachs (1949-1950)
Prof. Charles Crussard (1950-51)
Late Dr. G. P. Contractor
Acting Director (1951-53)

Dr. T. Banerjee

Shri P. I. A. Narayanan
The National Metallurgical Laboratory was inaugurated on 26th November, 1950 by late Pandit Jawaharlal Nehru with the objective of fostering applied and fundamental metallurgical research on an organized basis and to serve as a central station for carrying out research and development work on indigenous ores, minerals, refractories, ferrous and non-ferrous metals and alloys etc. in relation to their potential applications in Indian mineral and metal industries.

With the advent of Five Year Plans shortly after independence, stress was laid on the establishment of basic industries and utilization of indigenous raw materials. In this context, the laboratory's research and development programme was reoriented to suit the requirements of dynamic growth and expansion of Indian mineral and metal industries under the impact of successive Five Year Plans. The discoveries of new deposits of virgin raw materials and the dearth of foreign exchange added additional responsibility on the laboratory to find out ways and means of the utilization of available resources to the fullest extent as well as development of substitute products to minimize and eliminate as far as practicable the imported metals, alloys and minerals.

There was thus need for expansion of the laboratory to cope up with increased quantum of work in multifarious fields of metallurgical science and technology. The laboratory was, therefore, progressively equipped on modern lines to undertake planned research and development projects in the context of country's industrialization programmes.

It became imperative in pursuing various applied projects to study on pilot plant scale trials, potential practical themes so as to determine their suitability for commercial exploitation under Indian raw materials conditions. This resulted in progressive establishment of various pilot plants. With the changing pattern of industrialization, installation of more number of pilot and semi-commercial plants are being actively pursued. Many of these pilot plants and precision equipments are entirely designed and fabricated by the laboratory.

The research and development work of the National Metallurgical Laboratory, during the last decade, have been geared up to generate a continuous dialogue between the researchers, planners, users and industries for identification and solution of problems pertaining to various disciplines of metallurgy against the background of industrial and national needs. This has resulted in winning the confidence of the industries and forging close links with them. The metal and mineral industries both in public and private sectors are showing keen interest in the processes and products developed by the Laboratory and are referring their problems and sponsoring projects in ever increasing number.

The National Metallurgical Laboratory has developed expertise in many disciplines which is utilized by industrial and other organizations both at national and international levels. Such consultancy work relates to preparation of feasibility and investigational project reports, setting up and commissioning of plants, solution of plant operation problems etc. Thus, based on extensive pilot plant investigations, consultancy and assistance provided the following plants have either been installed or under installation.

1. Iron Ore Beneficiation and Sintering Plants of M/s. Hindustan Steel Limited.
2. Iron Ore Beneficiation & Sintering Plant of M/s. Tata Iron & Steel Co. Ltd.
5. A Central Pelletization Plant in Collaboration with MECON.
8. Beneficiation Plant Malanjkhand Copper Project for M/s Hindustan Copper Ltd.


13. Graphite Beneficiation Plant and Graphite Crucible Production Plant for Andhra Pradesh Industrial Development Corporation.


The Laboratory's contribution during the past two and half decades is by no means small. India's first commercial sponge iron plant has been commissioned and started production based on the technology of solid reduction process as developed in the Laboratory. The plant has been set up by M/s. Andhra Cement Company, Vijaywada, with the assistance and technical collaboration of the Laboratory. Production of sponge iron apart from mitigating the shortage of steel scrap will greatly facilitate in increasing the steel production through mini steel plants in the country.

The development of electric grade aluminium alloy (NML—PM2) has made a considerable impact in substituting the imported copper for production of electrical conductors, cables, winding wires etc. The product developed in the Laboratory is under commercial production by M/s. Aluminium Cable and Conductor (UP) Ltd., Calcutta, M/s. Bharati Smelting & Refining Corporation, Bombay and M/s. Galada Continuous Casting Ltd., Hyderabad. An indigenous electrical resistance alloy suitable for manufacture of heating elements has been developed and is now under commercial production by M/s. Cable Works (India) Ltd., Faridabad. Another firm M/s. Burjwal Electricals, U. P. is installing a plant for its production. The alloy developed can replace the conventional imported heating element like 'Nichrome', 'Kanthal', etc. containing nickel and cobalt which are at present not produced in the country.

For the manufacture of alloy, tool and special steels, special types of ferro-alloys are needed which are to be imported. NML has developed know-how for the production of some special types of ferro-alloys which are now commercially produced by a number of firms which have resulted in reducing and eliminating their imports.

For the first time in the country, vanadium has been extracted on an industrial scale at Mysore Iron & Steel Works, utilizing the Laboratory developed technology, from vanadiferous iron ores available near Bhadravati, where the steel plant is situated. This technology also yields high grade pig iron as a bye-product.

Medium phosphoric Indian pig iron requires to be treated by basic open hearth process for conversion into proper grade steel which needs heavy capital investment. NML has developed technique for its conversion directly into steel by side-blown basic converter process which can be installed and utilized by medium and small steel foundries to meet their needs for steel casting. The 'know how' developed has been licensed for commercial production.

In the manufacture of lower denomination coins like 1, 2, 3, 5 and 10 paisa coins, the aluminium—magnesium alloy developed by the Laboratory in collaboration with Govt. of India, Mint, is utilized. This has replaced the use of copper and nickel which are to be imported for the purpose. Due to the scarcity of zinc the Laboratory's technique of producing aluminized steel products in place of galvanized materials is commercially implemented by a number of firms. The processes of manufacturing electrolytic manganese metal from low grade ores, preparation of synthetic cryolite etc. are now under commercial implementation.

In the field of corrosion of metals and alloys, the Laboratory has developed an aluminium based alloy which can be used in place of the conventional imported alloy for protection of the hull of the sea going vessel. Besides, a large number of industrial corrosion problems have been investigated and suitable remedial measures suggested which have resulted in minimizing the plant corrosion problems.

Standard reference materials are imported for the purpose of accurate chemical analysis. The Laboratory has developed technique and now producing different types of standard materials for chemical and spectrographic analysis which are supplied to research and industrial organizations to meet their need.

To assist the foundries, the Laboratory has investigated a large number of foundry moulding sands and bonding clays and have determined their suitability for different casting purposes. This has helped the foundry industries in selecting the proper types of foundry raw materials and also setting up sand processing units. A large number of industrial foundry problems have been success-
fully solved and foundries concerned have been furnished with findings followed by practical demonstration of the operations involved. An equi-blast-cum-balanced blast cupola developed by the Laboratory has been set up in a number of foundries in Punjab and Haryana Region. A type of self-setting sand and wear and abrasion resistant cast iron have also been developed.

An important item in metal production is the refractory materials which are used in lining of the furnace for the protection of the metal structure. Many types of refractories such as fosterite refractories, sillimanite refractories, kyanite refractories, carbon refractories, magnesite refractories, chromemagnesite refractories etc. have been developed from raw materials hitherto unexploited. A dense carbon aggregate suitable for making soderberg paste for the manufacture of electrodes in electric furnace has been developed which otherwise has to be imported. Carbon and clay bonded graphite crucibles suitable for melting of non-ferrous metals were used to be imported. Based on the technique developed in the Laboratory these products are now manufactured in the country mostly from indigenous raw materials. A type of welding flux suitable for submerged arc welding, which used to be imported, is now commercially produced utilizing the NML process.

Causes of service failures of metals and alloys in commercial plants and equipments have been extensively investigated in the Laboratory and suggestion to overcome such failures have been furnished to concerned industries. Utilization of metallurgical waste products has been focussed by the National Metallurgical Laboratory to meet many of the essential needs of the country. The ‘know-how’ of recovery of
zinc from galvanizers’ dross has been licensed to industry. A process for the recovery of tin from tinplate scrap has been worked out which can lead to the conservation and utilization of this valued imported metal. Know-how for the preparation of various types of metallic powder have been developed and licensed for commercial production.

Many of the precision equipments, apparatus and pilot plants have been fully designed and fabricated in the Laboratory which has saved considerable amount of foreign exchange as well as economised the expenditure of the Laboratory.

For the development of steels for high temperature service as required in aircraft, boilers, pressure vessels, turbine etc. the Laboratory with the assistance of UNDP has set up a Creep Testing Laboratory with 150 Test points with provision to expand to 400 Test Points.

The future development programme of the Laboratory comprises of augmentation of mineral beneficiation and extraction metallurgical facilities and a National Corrosion Research Centre with the assistance of UNDP. Adequate Metal working facility has also been planned.

Due to unfortunate force of circumstances the Laboratory has suffered due to lack of space. Its activities and residential colonies had to be dispersed over widely separated small patches of land obtained from time to time. In view of this, a decision was taken to obtain one single piece of 10 acres at Adityapur, about 10 Kilometres from Jamshedpur for the development and expansion programme of augmentation of mineral beneficition and hydro-electro-metallurgical extraction facilities.

A major activity of the Laboratory relates to the free technical advice given to the industries for solution of their problems, which do not involve any investigational work. A large number of industries, particularly the small scale industries, have been benefitted by this service.

The Laboratory is holding periodic ‘Get-togethers’ in respective State Capitals, to appraise the industries the products and processes developed by the Laboratory and the assistance that can be rendered for the commercial exploitation of these materials as well as to study and investigate their problems for the betterment of their products. Entrepreneurs, industrialists, business people as also Govt. Officers join in these get togethers.

For the dissemination and exchange of technical information and ideas, the Laboratory holds symposia and seminars on topical metallurgical and allied subjects. Twenty such symposia and seminars have been held so far and most of the proceedings containing technical papers and discussions have been published. Besides, the Laboratory brings out its own journal, ‘NML Technical Journal’ which has been well received in the world of technical journalism. Monographs relating to results of investigations conducted on specific subjects are brought out from time to time. A monthly publication on ‘Documented Survey on Metallurgical Development’ containing classified abstracts of papers pertaining to metallurgical and allied field published in various scientific and technical journals of the world is also brought out. A House bulletin entitled ‘NML News Letter’ is published monthly for internal circulation.

The National Metallurgical Laboratory during its twenty-five years of existence has contributed towards setting up of several commercial plants through consultancy and investigation and production of a number of products based on indigenous raw materials which have saved a few crores of rupees in terms of foreign exchange.

The scope of research and development work at National Metallurgical Laboratory is as vast as it is challenging; this challenge is being effectively met by a band of dedicated scientists and staff which has resulted in its obtaining recognition both from overseas and at home as one of the leading metallurgical centres of research.
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<tr>
<th>Name</th>
<th>Present Designation</th>
<th>Date of Appointment</th>
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<tr>
<td>Shri G. C. Mishra</td>
<td>Mechanic</td>
<td>2.12.1946</td>
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<tr>
<td>P. R. Mahanty</td>
<td>Mistry</td>
<td>7. 1.1948</td>
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<td>D. S. Tandon</td>
<td>Scientist 'C'</td>
<td>9. 4.1948</td>
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<tr>
<td>Sewa Singh</td>
<td>Scientist 'C1'</td>
<td>30. 8.1948</td>
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<tr>
<td>Md. Yakub</td>
<td>Foreman</td>
<td>6. 9.1948</td>
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<td>Gian Singh</td>
<td>Assistant</td>
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<td>Amlok Singh</td>
<td>Foreman</td>
<td>20. 9.1948</td>
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<tr>
<td>Motilal</td>
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<td>23.10.1948</td>
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<td>B. B. Mishra</td>
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<td>Shambhu Singh</td>
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<td>Sudhanshu Kr. Bose</td>
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<td>H. K. Chakraborty</td>
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<td>K. N. Mukherjee</td>
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<tr>
<td>Harbhajan Singh</td>
<td>Foreman</td>
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<td>G. B. Paul</td>
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<td>1. 3.1949</td>
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<td>B. N. Pani</td>
<td>Sr. Gestetner Operator</td>
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<td>K. N. Srivastava</td>
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<td>16. 5.1949</td>
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<td>A. M. Nair</td>
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<td>N. G. Banerjee</td>
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<td>24. 5.1949</td>
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<td>Shri Mukhtari Lal</td>
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<td>Kartar Singh</td>
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<td>Mohinder Singh</td>
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<td>41.</td>
<td>Shri N. N. Lahiri</td>
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<td>42.</td>
<td>&quot; R. Rama Rao</td>
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<td>43.</td>
<td>&quot; H. A. Deb</td>
<td>Mechanic</td>
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# Awards Received by Staff Members
(Past and Present)

<table>
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<tr>
<th>Awards</th>
<th>Recipient</th>
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<tr>
<td>Padma Shri by President of India</td>
<td>Dr. B. R. Nijhawan</td>
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<tr>
<td>Shanti Swaroop Bhatnagar Memorial Award by CSIR</td>
<td>Dr. B. R. Nijhawan</td>
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<td>National Metallurgists' Award by Ministry of Steel &amp; Mines Government of India</td>
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<td></td>
<td>1. Prof. V. A. Altekar</td>
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<td>3. Dr. R. Kumar</td>
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<td>National Mineral Award by Deptt. of Mines, Ministry of Steel &amp; Mines, Government of India</td>
<td>Shri G. P. Mathur</td>
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<td>2. Dr. M. N. Parthasarathy</td>
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<td>Kamani Gold Medal by Indian Institute of Metals</td>
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<td>Invention Promotion Board Award</td>
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<td>Dr. K. G. Naik Gold Medal by University of Baroda</td>
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<td>Sir Padamji Ginwala Gold Medal by Indian Institute of Metals</td>
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<td>Capt. N. N. Dutt Medal by Council of Chemists, India</td>
<td>Shri A. Ghosh</td>
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<td>Distinguished Alumnus Award of Banaras Hindu University, Department of Metallurgical Engineering</td>
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<td>4. Shri R. M. Krishnan</td>
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<td>5. Dr. R. Kumar</td>
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**Staff Members (Past and Present) Who Received Doctorate Degrees, Submitted Thesis and Registered for Submission of Thesis on The Basis of the Work at NML**

### A. Received Doctorate Degree

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<tr>
<th>No.</th>
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<tr>
<td>1.</td>
<td>Dr. P. L. Ahujha</td>
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<td>Dr. U. Chatterjee</td>
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<td>Dr. P. K. Panda</td>
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<td>Dr. P. Prabhakaram</td>
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<td>14.</td>
<td>Dr. Ved Prakash</td>
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<td>Dr. Inder Singh</td>
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<td>19.</td>
<td>Dr. Manjit Singh</td>
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<tr>
<td>20.</td>
<td>Dr. Khalaf</td>
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<td>21.</td>
<td>Dr. Shariff</td>
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<td>Dr. B. P. Varma</td>
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20. Dr. Khalaf Scientists from United Arab Republic under the Scientific and
21. Dr. Shariff Technical Co-operation Agreement between Govts of India and United Arab Republic

### B. Submitted Thesis

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<td>1.</td>
<td>Shri R. Haider</td>
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### C. Registered for Submission of Thesis

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<td>Shri M. K. Banerjee</td>
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<td>Shri B. K. Saxena</td>
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<td>6.</td>
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<td>7.</td>
<td>Shri A. V. Subhramaniam</td>
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EXPENDITURE OF NML
(FIGURES IN LAKHS OF RUPEES).

T — TOTAL
R — RECURRING
C — CAPITAL
P — PILOT PLANT
S — STAFF QUARTER


T 25.14 53.22 84.18 87.82 154.77
R 12.0 23.75 29.75 20.96 19.28
C 5.14 5.24 5.81 7.91 3.50
P 18.55 5.66 14.5 2.73 3.50
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RUPEES IN LAKHS
## Research and Investigation Reports Prepared

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## Papers Published and Presented

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PAPERS PUBLISHED AND PRESENTED


NUMBER
## Sale Value of NML Products and Total Royalty Earned

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## NML Processes and Products Under Commercial Implementation

### A. Processes Under Production

**Process**

1. Improved carbon bonded graphite crucibles

   **Name of the Licencsee**
   
   i) M/s. Patna State Graphite & Mining Co. Ltd., Titilagarh, Orissa.
   
   ii) M/s. Mattapalli Satyam & Sons Samalkot, Andhra Pradesh (likely to commence production shortly).
   
   iii) M/s. Silcarb Crucibles (P) Ltd. Vapi Industrial Estate, Vapi Gujarat State. (Released in 1973). The plant is expected to commence production at the earliest.

2. Improved clay-bonded graphite crucibles

   **Name of the Licencsee**


   ii) M/s. Patna State Graphite & Mining Co. Ltd., Titilagarh.

   iii) M/s. J. D. Jones & Co. (Bihar) Ltd., Jamshedpur.
RECEIPTS OF NML
(Figures in lakhs of rupees)

1960-61: 0.046
1965-66: 0.024
1970-71: 0.109
1973-74: 0.072

Sale of products produced at NML
Receipts against investigations
Sale of publications
3. Carbon free ferro-alloys
   i) M/s. Electric Control Gear Pvt. Ltd., Ahmedabad
   ii) M/s. Saindas Kishan Chand Mehra, Amritsar
   iii) M/s. R. Sen & Co., Calcutta
   iv) M/s. T. K. Industries, Kurukshetra
   v) M/s. Industrial Minerals & Chemical Co. Ltd., Bombay
   vi) M/s. Stemet Alloys Ltd., New Delhi
   vii) M/s. Bharat Pulvenishing Mills Ltd., Bombay

4. Hot-dip aluminising of ferrous materials
   i) M/s. Sri Venkata Durga Aluminising Works Ltd., Nandigama, AP (Aluminised wires)

5. Fluxes for submerged arc welding
   M/s. Tapadia Engineers & Traders Ltd., Raipur

6. Bright nickel plating salt
   M/s. Dunlop India Ltd., Calcutta

7. Electrical resistance alloys for heating elements
   M/s. Cable Works (I) Ltd., Calcutta

8. Metal powders by atomization (i) of molten metals
   (Al & Zinc-60 to +200 mesh size)
   ii) M/s. Sinterfine Metal Powders, Delhi

9. Electric grade aluminium alloy
   i) M/s. Aluminium Cables & Conductor Ltd., Calcutta
   ii) M/s. Bharati Smelting & Refining Corporation, Worli, Bombay, to commence production shortly
   iii) M/s. Galada Continuous Castings Ltd., Uppal, Hyderabad

10. Production of sponge iron with solid reductant
    M/s. Andhra Cement Co., Vijaywada

11. Production of ferro-vanadium
    M/s Mysore Iron & Steel Works, Bhadravati

B. Processes Released and Production to Commence

1. Thermostatic bi-metals
   M/s. Cable Works (I) Ltd., Calcutta

2. Ceramic magnets
   M/s. Tapadia Engineers & Traders Pvt. Ltd., Raipur

3. Electrolytic manganese dioxide
   M/s. T. K. Chemicals, Bombay

4. Production of extra fine zinc dust
   M/s. Associated Pigments Ltd., Calcutta (under installation)
   i) M/s. Mehra Ferro Alloys Ltd., Amritsar
   ii) M/s. Kartar Iron & Steel Co., Ltd., Jammu
   iii) M/s. Pratap Steels Ltd., Mahindra Garh, Amritsar (awaiting Govt. of India's clearance)

5. Basic lined side blown converter

6. Bi-metallic powders by atomization
   M/s. Paras Metal Powders, Nasik

7. Extra-fine non-ferrous metal powders by atomisation
   M/s. NALCO Metal Products Ltd., Madurai.
Priced Publications

NML Technical Journal—a Quarterly Publication

Proceedings of Symposia and Seminars on

Electroplating and Metal Finishing
Industrial Failure of Engineering Metals and Alloys
Non-ferrous Metal Industry in India
Recent Trends in the Field of Production, Practice and Research Refractories used in Metal Industries
Production, Properties and Application of Alloy and Special Steel
Mineral Beneficiation and Extractive Metallurgical Techniques
Recent Developments in Foundry Technology
Iron and Steel Industry in India
Pilot Plants in Metallurgical Research and Development
Ferro Alloy Industry in India
Light Metal Industry in India
Utilization of Metallurgical Wastes
Micro Metallurgy—the role of minute additions to ferrous and non-ferrous metals and alloys
Metallurgy of Substitute Ferrous and Non-ferrous Alloys
Non-Ferrous Metals Technology (Vols. 1, 2 & 3)
Science and Technology of Sponge Iron and its Conversion to Steel
Bacterial Leaching

* * * * * * *

Monographs on

Low Grade Manganese Ores of India
Austenitic Grain Size Control of Steel
Foundry Moulding Sands
Indian Foundry Bentonite Clays
Structure of Electro-deposited Manganese
Atlas on Transformation Diagrams of Low Alloy Steels

* * * * * * *

Documented Survey on Metallurgical Developments—A monthly publication
<table>
<thead>
<tr>
<th>Serial No.</th>
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<td>1.</td>
<td>A process for the hot-dip aluminising of ferrous materials</td>
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<td>2.</td>
<td>Aluminising of iron and steel</td>
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<td>Refractory compositions comprising graphite and silicon carbide</td>
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<td>New stainless steels and methods of preparing them</td>
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<td>Improvements in or relating to hot-dip aluminising of steel</td>
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<td>Refractory compositions comprising graphite and aluminosilicate materials and glazes to render such compositions resistant to oxidation</td>
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<td>An improved method for the production of chromium-manganese alloys by aluminothermic reaction</td>
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<td>Compositions and methods of making welding flux</td>
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<td>Improvements in or relating to the production of copper powder by electrolytic process</td>
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<td>Improvement in or relating to a precision temperature controller for use with electrical resistance furnaces up to 1600°C</td>
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<td>An improved device for the isolation of dross in molten metallic baths during continuous hot-dip processing of strip or wire</td>
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<td>A pneumatic process for the conversion of phosphoric pig irons to steels</td>
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<td>Stable castable suspensions of non-plastic aluminosilicate materials and method of making the same</td>
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<td>A process for selective reduction of iron oxide in complex ores</td>
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<td>An improved method for the extraction of metals from solution by solid state absorption</td>
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The National Metallurgical Laboratory encourages the social activities for the staff. A well organised NML Club has been formed since 1953. The club conducts various outdoor and indoor games like cricket, football, badminton, volleyball, table tennis, chess, cards etc. and competitive tournaments are organised. The club also participates in various local tournaments. The NML Cricket Club is a recognised team under Bihar Cricket Association and plays in the cricket league. The Laboratory teams also participate in Shanti Swaroop Bhatnagar Memorial Tournament organised by CSIR and have won winners and runners-up trophies in tennis, table tennis and volleyball. Annual sports and picnics are held in which the staff and their family members join. Cinema shows are held regularly for the NML staff and their families.

Two Kindergarten Schools for the NML colony children at Agrico and Tuiladungari colonies have been established. The Welfare Committees of these two colonies look after the security and cleanliness of the colonies and organise cultural shows, sports etc. Arts and music classes are held for the boys, girls and ladies of the colony.

NML staff Cooperative Credit Society is operating for more than a decade and is handling transactions worth nearly rupees two lakhs annually. The Staff Co-operative Stores is supplying rations, foodstuff, stationery articles to the staff members at controlled rate. A canteen is run by the NML staff and it provides lunch, snacks, tea, coffee etc. at reasonable prices.

For facilitating the banking and postal work of the Laboratory and its staff, the Laboratory has provided accommodation within its premises for functioning of a branch of State Bank of India and a post office.
NML Staff Members donating blood for Blood Bank

Kindergarten School at NML Colony
Mrs. V. A. Altekar donating clothes collected by ladies of NML Staff colonies for the Bihar Flood relief

NML Staff Children in a Sports event
A view of the NML Residential Flats at Agrico Colony
Davy Ashmore India Limited

Proudly announces their association with the National Metallurgical Laboratory towards the development of steel production in Basic-lined Side Blown Converters

Davy offers the Side Blown Converters from 2 M/T to 5 M/T capacity, manufactured to the design and knowhow of Davy-Ashmore International Limited U.K. (formerly Ashmore Benson & Pease)
VERSATILITY PLUS, PERFORMANCE PLUS,

THE ONLY SOLID STATE ULTRASONIC FLAW DETECTOR.

It's little wonder why the railways nabbed our flaw detectors. They set stringent specifications — but our units more than matched them. They carried home the only solid state unit in the country.

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(ii) to guide and conduct applied industrial research in collaboration with industries/institutions in the country and provide nation wide Documentation & Information Services in Foundry, Forge and allied fields.

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(Figures in metric tonnes)

<table>
<thead>
<tr>
<th>March '75</th>
<th>April '74 to March '75</th>
<th>April '73 to March '74</th>
<th>April '72 to March '73</th>
</tr>
</thead>
<tbody>
<tr>
<td>3248</td>
<td>15801</td>
<td>12899</td>
<td>12596</td>
</tr>
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</table>

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