Presidential Address

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Hon'ble Minister Shri Shivaraj V. Patil, distinguished delegates to the seminar, Hon'ble guests, Ladies & Gentlemen;

As President of the Indian Institute of Mineral Engineers as well as Director of the National Metallurgical Laboratory, I would like to add to the welcome greetings already extended to you on the occasion of National Seminar on Mineral Processing and the concurrent IX Annual Technical Convention of the IIME. It is indeed a great privilege to have the Hon'ble Minister with us inspite of his very busy schedules and prior commitments. The Indian Institute of Mineral Engineers just completed 16 years of its fruitful existence and, as you are all aware, it constitutes the pioneering forum for the discussion of all the scientific, technological and engineering aspects of mineral industries, not only in India but also in the world wide context. A firm indication of the coming of age of the IIME is not only its affiliation with the International Mineral Processing Congress, but the fact that the forth-coming International Conference will soon be held in India under the joint auspicies of IMPC and IIME. I have no doubt that the Govt. of India and the CSIR will give all the support to make the forth-coming event an international success.

NML, on the other hand, has provided the foundation for the needed R & D in mineral processing in India in addition to its commitments in the areas of ferrous and non-ferrous metallurgy, with the first mineral dressing pilot plant established at NML in 1960. Since then NML has never looked back. More than 600 investigations have been completed and many are going on. Almost every component of the Indian Mineral Industry has been benefited by the investigations made here. Beneficiation and extraction studies have been carried out even for other nations like Egypt, Syria, Nepal and Bhutan. Technical assistance has also been rendered by NML scientists through agencies like UNDP, to countries like Egypt and Nigeria. I shall briefly elaborate some of the NML's contributions a little later.

I am sure I need not stress the importance of planned utilisation of mineral resources in a world that is today perenially beset with shortages of resources of one type or the other. However, if men were to revert to the primeval times, by the end of the century as has been predicted by none less than Bertrand Russel himself, it certainly will not be ascribable to the depletion of the world's resources of minerals. Because fortetuously most alarms that sound from time to time themselves lead to renewed and more intense efforts at locating new mineral resources of exploiting lesser known or the lower grade deposits as well as developing alternative materials and higher technology. These include greater recycling of waste materials and thereby almost continuously ensuring comfortably adequate reserves for the foreseeable as well as distant future.

Mineral resources have undergone much keledeoscopic transformations. Predictions have been made from time to time that the proven deposits of metals like Nickel, Aluminium and Zinc would last for less than fifty years or that deposits of Lead, Copper and Mercury would peter out in the next thirty years. However such forecasts have been also cancelled by announcements of findings of new deposits of

often hundreds of millions of tonnes of fairly rich mineral reserves such as of massive bauxite, copper, lead and zinc ores as also deposits along the continental shelves. More recently the abundance of polymetallic nodules on the ocean floor has also been proved and if anything, it has put off the mineral scarcity decades beyond the end of this century. None the same the periodic alarams sounding off the impending shortages, have provided the warnings necessary to spark off and spur on the interminable thrust for substitution and development of even higher technologies—the two imperatives that cannot be ignored if mankind is to survive if and when such shortages become real and totally unavoidable. Ironically, the problem is further aggravated by the successful efforts in developing and underdeveloped countries to raise the existing standards of living which lead inexorably to steep raises of per capita consumption of minerals We must therefore have indepth knowledge of affairs in the area of minerals in order to assess the proven resources as also the resources likely to be uncovered in the next half century or more.

It is imperative to explore possibilities of greater conservation, to develop substitutions of the more scarce materials, to review and revamp the R & D efforts already underway and to organise newer and more modern approaces to R & D and to plan and establish an exhaustive data bank with capabilities of turning into higher technological developments suited to ongoing situations in the area of minerals and mineral processing. In short, a continuously sustained planning and monitoring effort for the judicious utilisation of mineral resources becomes imperative in order to eliminate any serious gap in supply and actual consumption.

In any reference to planning the most effective utilization of mineral resources cognizence has to be given not only to the modernisation of existing technologies in use, but equally to the newer and engineering technologies both for obtaining the required minerals from the natural deposits, or heaped reserves and wastes, as well as to the extraction of the desired values from these sources. The complexity of the task of finding optimum or optimal value engineered methods and process routes, naturally calls for heavy investigational and R & D efforts. To mention a few of the recent developments in the area of minerals and mineral processing with particular reference to India, we have for example, the slurry transport of minerals from mines to user-sites to ports as well as ship loading and subsequent unloading and again from the port to user-site with important peripherals such as possibilites of the power generation where slurry pipelines have adquate down hill gradients, as well as fresh water recovery from the slurries, a situation which exists at Kudremukh.

Bigger and better crushing and grinding units approaching the massive autogenous grinding units which are in vogue in many of the developed countries which measure upto about 32 feet diameter as well as large size ball mills, rod mills, aerofall mills having capacities of the 2000 tpd. coupled to continuous particle size monitoring by ultrasonics.

Recent developments in mineral engineering include newer concentration methods such as the cyclone-flotation cell for quick settling at higher capacities with improved recovery and good selectivity, use of air-pulp injection in flotation, use of newer floation reagents which is a very virgin area with a lot of organic chemicals being developed and made available to try out the surfactant properties of these organic chemicals. Adoption of high intensity magnetic separation methods on a wider scale, may considerably help in pollution control measures especially for sulphur emissions as well as for slime effluents.

An important emerging mining and extraction technology that I must also mention is that of geo-microbiological solution mining, which enables not only the utilization of normally non economic ores, but at the same time, uses natural and abundantly renewable energy of microbes

literally to simultaneously mine in-situ and extract the required metal or metals in a highly cost effective and non-polluting manner. This is not a new technology since heap leaching has been practiced for many decades and today as many as half a million tonnes of copper metal are being extracted by this technique. Uranium also is extensively solution mined in Canada and other countries. Heavy R & D imports are evident in the Soviet Union, U. K., USA, Australia, Japan and in our country.

Presently efforts are on to bring an increasing number of metals including even titanium and aluminium into this bio-technology fold. Considerable prospects have also been proven for the microbial desulphurisation and dephosphorisation of coal and even extracting rare metals from sea nodules. It should not be too surprising if commercial solution mining as well as microbial heap and tank leaching, see a considerable upsurge in in-situ mining and extraction of metals by the end of this decade in this country.

In India in the area of planning for mineral and metal science technology dates back to the mid seventies, with the sectorial activity initiated by the then National Committee on Science and Technology the NCST, which prepared what could be called, the first blue print in this area.

It was aimed at the exploration of principal minerals and their utilization in all their various froms inclusive of fines, leaner grade material as well as the processing technology itself. Reviewing the position of various metallic minerals, the NCST has estimated that before the end of the decade, over 100 m. tonnes of iron ore would be required. It also estimated that about 5 m. tonnes of manganese ore would be needed. Chromite demand was forecast at 200 thousand tonnes for internal use only in the chemical and metallurgical industries, with an additional allocation for export to the extent of about 100 thousand tonnes of chromite. Based on this study, NCST outlined the R & D inputs and the augmentation cum modernisation of institutional facilities such as the National Metallurgical Laboratory. These would be required both for mineral beneficiation and agglomeration as well as adequately updating the extraction procedures and equipments. Various R & D centres were named for indivdual tasks, which included the National Metallurgical Laboratory where a large scale multi-purpose testing facility was proposed for the extraction of non-ferrous metals with the twin objectives of developing an Indian base for technology development and to update the technologies in use as well as modernise equipment from ore analysis to primary and secondary metal production.

The importance of minerals in Indian economy, is also reflected in the massive investments in the area. The index of expenditure budgeted for 1984-85 for mineral exploration and development alone, was over 50 crores as against the actuals of less than 40 crores in 1983-84 by such agencies like the Mineral Exploration Corporation and the Geological Survey of India. These figures are indicative of the size of the investment and returns in the area of minerals and metals and resources-wise, the scene in Inida is reasonably good to be told. With 15,000 million tonnes of iron ores, iron and steel making should continue unhindered for a great many decades beyond the year 2100 A.D. The copper scene is also pleasant with a stock of 19 million tonnes of metal available untapped in form of ore reserves exceeding 2000 million tonnes. Aluminium metal in bauxite form could top 300 million tonnes and so on. And added to these mineral resources, the Indian Continental shelf, as well as India's share in the ocean bed desposits of sea nodules, resources, that do not call for despondancy.

The non-metalic minerals such as coal are also plentiful and rated at about 9,000 million tonnes most of which can be used by adopting appropriate technologies. Even sulphur requirements could well be met, by resorting to newer methods of extraction including such as

microbial leaching of gypsum and the several large pyrite and pyrrhotite deposits that are being developed in the country.

Refractory minerals, too are available in abundance in the country. Problems pertaining to non-standard raw materials can easily be eliminated by developing and using appropriate technologies for beneficiation.

Although the changing scene in the raw material requirements due to oxygen steel making calls for higher quality materials such as low iron, low silica magnesites and limestones, India could go into the production of magnesia from sea water, like many other countries. Land deposits of magnesites exceeding 200 million tonnes are also available in the country though beneficiation is required to reduce silica to minimal norms of less than 1%. Although higher grades of kyanite containing over 55% alumina are approaching depleted levels, we have abundant resources of kyanite which contain about 30% alumina, which again need beneficiation.

It is in this context that one has to dispassionately view the role of R & D Institutions like the National Metallurgical Laboratory. Here, we have done about 600 investigations as I have already pointed out, and these have covered the entire gamut of minerals available in the country, even, I believe, I should include diamonds of Panna. The thrust in activities concerning minerals processing is quite considerable in the twin areas of ore dressing and extraction of the values from the ores of metals as well as non-metals. I must mention here the confidence reposed by the industries in sponsoring programmes at this laboratory by the companies such as the Tata Iron & Steel Co., the various steel plants in the public sector such as Rourkela, Bhilai, Bokaro, Durgapur, the National Mineral Development Corporation, the Gujrat Mineral Development Corporation, Hindustan Copper, Hindusthan Zinc and many State sector mineral development corporations. We have been working in close interaction and association with SAIL, MECON, Engineers India Ltd, Dastur & Co. and several other agencies which acted as via media, translating the results of the investigations of this laboratory into successful plants.

To our credit we have the iron ore washing plants at Barsua and Kiriburu, Noamundi, Bailadila, iron ore sinter plants at Rourkela, Bhilai, Durgapur and TISCO, the diamond gravel plant at Panna, fluorspar benefication plant of GMDC in Gujrat, and another one coming up in Chandidungri near Bhilai for the Maharastra Minerals Corporation, Copper ore concentrator for the Hindustan Copper Limited at Rakha, and again the latest one at Malanjkhand, the central pelletisation plant for iron ores proposed for Barajamda area, beneficiation of rock prosphate at Rajasthan and Mussorie, graphite beneficiation at Banswara and Titlagarh.

Coal middlings and rejects which contained as much as 45% to 50% ash were upgraded to ash contents of about 11 to 15% for the Central Coalfields Limited. I must mention here about our most recent work that we have done for the thermal power plants at Ennore near Madras and Tuticorin in Tamilnadu, where again we have been able to bring down the ash content from a level of 45% to a level of 19% ash with recovery of combustibles more than 85%. One can imagine the tremendous wear and tear on the boiler pipes with the 45% ash coals. The beneficiated coal will bring down the wear and tear and improve the availability of the power plants from the present low level of 40% to the western level of 80 to 85%.

In the area of minerals for refractory industries, we have done work for a number of refractory industries. They are too numerous to be listed here. Presently we are putting up a beneficiation plant at Dahegaon in Bhandara Dist. of Maharashtra and this plant is coming up with NML consultancy for beneficiation of kyanite of lower grade level of 45% Al_2O_3 . We have been able to produce concentrates of 62—64% alumina which have been approved by the reputed

refractory manufacturers such as Belpahar Refractories Ltd.

I am hopeful that this convention will help to set the scene for making even greater strides in the area of mineral resources conservation, than development and judicious exploitation, in a highly planned manner in the interest of longest possible perspectives. It calls for a greater role to be played by the mineral engineers and I think with these challenging tasks ahead of you, you will take pride that you are contributing your mite to the development of the economy of the country. The mineral engineer is often ordained to operate within the rather narrow spectrum of economic latitudes that normally connect mining to metallurgy. As a result of such constraints forage into higher technology in India have unfortunately few and far between, and input of resources have also been far from generous. But I have little doubt that with enlightened government coming into being at the centre, they will view these problems as challenges to be met with the help of technologies that are being continuously developed by the mineral engineers.

Before I conclude I would like to add a note of optimism that in our country natural resources are plentiful although they are not up to the mark so far as quality is concerned. The new era of modernisation being ushered in by our young Prime Minister will lead not only to a systems approach but for a more thorough and mature planning as also to what is more important, the more effective and timely implementations of plans and projects, in order to contain the costs. This will enable the country to catch up much faster with the more developed countries, in whatever terms you choose to define. The mineral engineer, his colleagues from other disciplines and the mineral-based industries, I am sure, will play a very major role in this.

Friends, before I conclude I would like to add a personal note to what I have said. As the President of the Institute, I am laying down the office tomorrow and we are fortunate in having amongst us Mr. R. N. Sharma, the Ex-Chairman of Coal India Ltd. and presently the Vice-President of TISCO, a pioneer in the field of beneficiation of coal and allied fields and who has taken very deep interest in the activities of this Institute who has agreed to take over from me. I have no doubt that the same kind of co-operation and help that you have rendered to the Institute, you will continue to do so, so that the Institute plays its due role that is bound to be assigned to it.

I will also be laying down the office of the Director of the National Metallurgical Laboratory in a couple of weeks' time. I must therefore take this opportunity to thank my colleagues here, first of all who have maintained high traditions of service to the nation and have deligently worked for several important and challenging projects. It has brought an immense sense of gratification to me. I have also to acknowledge here the co-operation that I have received and the laboratory has received from the several sponsors from industries all over the country who have taken pride in comming to us, getting their problems solved, process flow-sheets developed and projects realised. It has been a very happy and gratifying experience for me to have been associated with all these projects of developments.

I would also like to thank my colleagues in the Institute, the Vice-President, particularly Mr. Jain who has been an undaunted supporter, a very enthusiastic worker so far as the institute activities are concerned. We have depended very heavily on his support, his dynamism and it has been largely due to his efforts that we have been able to carry out many of our activities such as the many refresher courses which we have arranged from time to time. To Mr. Khare also I owe considerable gratitude rather, and I acknowledge it.

Friends ! with these few words I would now like to end this address and I will now

request the Chief Guest Shri Shivraj V. Patil to release two important documents on this occasion, one is the Volume II of all the investigations, that we have done on the minerals of India. The Volume I was released by our late Prime Minister, Smt. Indiraji, about a couple of years ago. I have great pleasure in requesting Shri Shivrajji to release the second volume on this auspicious occasion. The other publication which is going to be released by him is the Proceedings of the Seminar on Ferro-alloy Industry which we had held a couple of years ago in this very same auditorium

Now, I request Shri Shivrajji to inaugurate the seminar.

Thank you.