ANNUAL REPORT

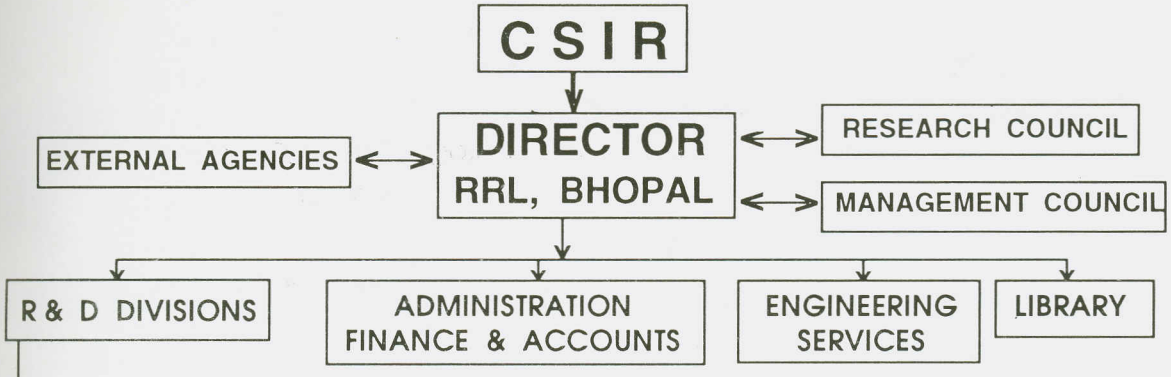
1992 - 93

वार्षिक प्रतिवेदन

REGIONAL RESEARCH LABORATORY
BHOPAL

CONTENTS

ORGANIZATION CHART



BUILDING MATERIALS	Low Cost/Alternative Bld. Mat & Components, Demonstration housing, Fly ash utilization, Natural Fibre and polymer products
METALLURGY & MATERIALS	Al-alloy Composites, Tribology, Farm & Mining implements, Squeeze Casting, welding RSP & Foundary Techniques Ceramic Fibres and Whiskers, Engg Failure Analysis
MINERALS	Benefication of Low Grade Ores Coal Preparation, Process Modelling
RESOURCES DEVELOPMENT	Resources, Modelling, Computer Applications, Planning, Monitoring, Evaluation, Technology Transfer, Information

LIST OF ABBREVIATIONS USED

BALCO	Bharat Aluminium Company
BHEL	Bharat Heavy Electricals Limited
BMTPC	Building Materials Technology Promotion Council
CBIP	Central Board of Irrigation and Power
CGWB	Central Ground Water Board
CIAE	Central Institute of Agricultural Engineering
CMC	Computer Maintenance Corporation
CMPDIL	Central Mine Planning and Design Institute Limited
CPWD	Central Public Works Department
CSIR	Council of Scientific and Industrial Research
DMRL	Defence Metallurgical Research Laboratory
DST	Department of Science and Technology
HUDCO	Housing and Urban Development Corporation
HZL	Hindustan Zinc Limited
IBM	Indian Bureau of Mines
ICAR	Indian Council of Agricultural Research
IISc	Indian Institute of Science, Bangalore
ISM	Indian School of Mines, Dhanbad
ISRO	Indain Space Research Organisation
NABARD	National Bank for Agricultural and Rural Development
NBO	National Building Organisation
NMDC	National Mineral Development Corporation
NTPC	National Thermal Power Corporation
OCL	Orient Cerawool Limited, Lakhtar
MOUD	Ministry of Urban Development
MPCOST	M.P. Council of Science & Technology
MPSMC	M.P. State Mining Corporation
PWL	Permali Wallace Limited, Bhopal
PPCL	Pyrites Phosphates Chemicals Limited

RRL BHOPAL AT A GLANCE 1992-93

Research Division	Total ECF* committed since Jan.90 (Rs. lakh)	Projects in hand
Building Materials	84.00	10
Metallurgy & Materials	80.00	12
Minerals	50.00	10
Resources Development	10.00	3

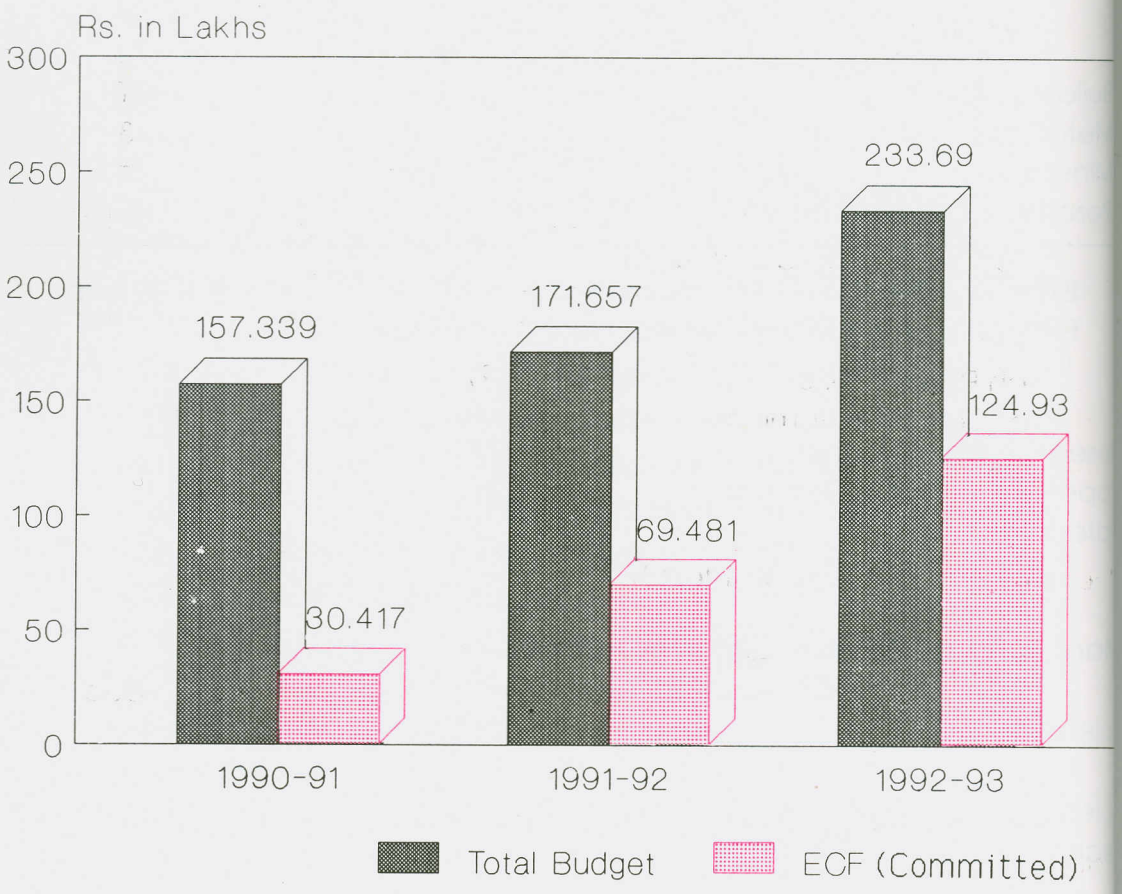
* External cash flow committed since Jan.90 : ~ Rs.225.00 lakh
Projects completed in 1992-93 : 13

Research Publications	-	27
Paper presented in Seminar	-	21
Patent filed	-	2

Manpower profile as on March 31, 1993

Scientists	Gr.IV	43	Ratio of Gr.IV + Gr.III to the rest ~ 1:1 as recommended by CSIR
Scientific & Technical Staff	Gr.III	18	
Total staff		**124**	

Budget Vis-a-Vis ECF



In Peer Review for Resources Allocation ECF targeted was Rs. 80 Lakh for 1992-93

OUR LINKAGES

To ensure user involvement from inception to various stages of development, RRL undertakes contract research projects, consultancy and other technical services for Govt. Agencies, industry, public undertakings and institutions. Some of our active linkages are mentioned below:

Central Govt. Depts., Agencies, Institutions

Dept of Mines, Indian Bureau of Mines, DST, Ministry of Urban Development, HUDCO, ISRO, DMRL, ICAR, CIAE, CGWB, NABARD, IISc, ISM, BMPTC, CPWD, NBO, UNICEF.

MP State

MPCOST, MP State Mining Corpn., State Water Resources Dept. Dist Administration in Tribal Regions.

Industrial Sector including PSE'S , private and local industry

BHEL, BALCO, CMPDIL, NTPC, NMDC, HZL, CMC, TISCO, M/s OCL Ltd., M/s PWL, Bhopal & PPCL.

DIRECTOR'S REPORT

निदेशकीय

DIRECTOR'S REPORT

Prof. T.C.Rao

PROLOGUE

It is a great privilege to present this Annual Report of the Regional Research Laboratory, Bhopal. During 1992-93, the Laboratory carried out multifarious activities in the major disciplines viz.,

Building Materials
Metallurgy and Materials
Minerals
Resources Development

These activities were systematically oriented towards the following objectives :

* Enhanced interactions with user agencies,

* Efforts to bring in involvement of such agencies, particularly, industries, in pilot/large scale trials of processes/products developed by the Laboratory.

As a result, opportunities are emerging in areas of wood substitute products, tribology studies on farm and mine implements, squeeze casting and metal matrix composites based on squeeze infiltration, FRP materials, coal preparation etc. Simultaneously, the cumulative external cash flow (committed) on account of externally funded assignments has aggregated to over Rs.220 lakh since January 1990. A stage has been reached, where the Laboratory has a time targeted R&D programme supported by user agencies.

While the details of R&D activities by the Laboratory are covered elsewhere,some highlights are mentioned in the subsequent sections.

R&D HIGHLIGHTS

Building Materials

A major effort was made on the "Wood Substitutes Programme" taken up by CSIR and CPWD, under the auspices of the Technology Advisory B (Materials Science & Technology). Red Mud Polymer (RMP) composite mo developed by the Laboratory for door shutters has evoked conside interest. RMP material and the door shutters are undergoing tests and evaluation at CBRI Roorkee and CPWD Preliminary tests and trials indic promising product. The specifications for this new product were jointly w out by CPWD and RRL Bhopal.

Another spin off from this project has been the decision to set up a Cen characterisation of Building Materials, with a specific reference to alte materials. BMTPC has provided a grant of Rs.28 lakh for setting up t equipment and facilities for this centre which will eventually have equip worth over Rs.75 lakh.

NBO is supporting a demonstration housing project (Rs.15 lakhs) under sixteen apartments will be constructed in the Laboratory campus . The p will incorporate the alternate/new materials, components and techn developed at RRL Bhopal.

Another interesting project (Rs.12 lakh) on fly ash utilisation for wast development is sanctioned by NTPC. The experiment will be undertak Rihandnagar.

Metallurgy & Materials

The Laboratory has undertaken projects (Rs.45 lakh) on tribological stu farm and mine implements with the support from ICAR and CMPDIL re tively. Aimed at bringing about improvement in the life and performan implements, this is a potential thrust area of the Laboratory. As a conseq to the expertise in this area, RRL Bhopal has been chosen for one of th surface engineering activity satellite centres being set up by the DST.

Efforts are underway to take up joint projects with industry on auto components based on squeeze casting and squeeze infiltrated metal

composites to fulfill the aspirations of commercial scale technology development. An interaction meeting with experts and representatives from industry was held on Jan. 29, 1993 to identify future course of action. Work on ceramic fibre preforms being carried out at M/s Orient Cerawool Ltd., Lakhtar progressed satisfactorily. Possible markets for this product within India and abroad are to be identified.

Three projects namely on ETP copper welding, Bonding of white metal to thrust bearings and Checking of PTFE insulation tapes were successfully completed for BHEL Bhopal.

An estimated saving of Rs.28 lakh annually has been reported by BHEL as a result of the zero defect welding process. Innovative practices were suggested by the Laboratory to overcome debonding problems in hydrogenerator thrust pads. Interactions on new projects with BHEL Bhopal are underway.

Minerals

Two projects related to beneficiation studies on low grade tin ore of Bastar and rock phosphate of Sagar and Jhabua districts, respectively were completed successfully for MPCOST.

The progress of the work on fertilizer minerals was reviewed in consultation with Shri CPS Nair, Former Technical Adviser, Dept. of Mines and experts from GSI and M.P. State Mining Corporation.

It is pertinent to note that it has been possible to achieve P_2O_5 content upto 30% (from as low as 10-12%) and SiO_2 content reduction to less than 10% on the siliceous rock phosphate from Hirapur (Sagar District).

RRL is to undertake preliminary studies on the 7Mt deposit of rock phosphate in Basai C Block of Hirapur. Steps have been taken for pilot plant trials of beneficiation of rock phosphates at IBM Ajmer. Work was carried out on short term consultancy assignments from TISCO Jamshedpur, HZL and PPCL.

Resources Development

Field investigations were undertaken at water logged areas in Hoshangabad district. Efforts were made to ensure association of State agencies in implemen-

tation of strategies emerging from present studies. One such micro le to evolve methodologies for alleviating water logging problems is bei up at Kharar Village.

The scope of activities and the expertise developed by the Laborat area is being taken note of and it is proposed to undertake work on gr ter contamination studies. In this connection, Prof. J.P. Greenhouse, Uni Waterloo, Canada, is visiting the laboratory to formulate joint studies.

A Short Term Course and a National Workshop on "Groundwater R Modelling and Groundwater Contamination" is being held in April'93.

Societal Programmes

The Laboratory contributions in this category relate to the following.

* Traditional metal base industry in backward regions,
* Extension of low cost housing,
* Natural resources data management system of block l village as a unit.

Further trainings and on site demonstrations of the improved techn metal base industry are being undertaken in backward areas, p Bastar region of M.P. A project on upgradation of blacksmithy tech backward regions of M.P. was completed.

Research Support and Technical Services

Following a one day seminar on R&D needs of metallurgical industri (Jan.92) and consequently a one day Industry-RRL Bhopal interaction (Aug.'92) (mentioned in subsequent sections), the Laboratory has concerted effort in identifying specific areas relating to activities of M and Materials Division. It is intended to organise research support, t services and information dissemination through a consortium. Already been a spurt of activities with many industries approaching the Labo such an interaction.

In other areas also viz., Minerals, Coal Beneficiation, Building Materials, have been undertaken.

The Laboratory was called upon by M.P. Electricity Board to participate in an all CSIR committee to carry out failure investigation studies at Sarni Thermal Power Station.

RRL, Bhopal entered into a five year agreement with the National Mineral Development Corporation, Hyderabad on Dec. 18, 1992. The agreement provides for services based on RRL expertise on XRD, SEM analysis by RRL to NMDC.

During this period testing and consultancy services were extended to a large number of industries and organisations in M.P.

INFRASTRUCTURE AND CAMPUS DEVELOPMENT

Many functional additions were made to the existing S&T infrastructure, particularly with a view to modernise and update the facilities. XRD APD software was added.

Several modifications in the laboratory buildings for additional space are nearing completion. Facilities for services including electricity and water supply were enhanced. The 33KV substation in the labcratory was inaugurated by Shri P.L. Nene, Chairman, MPEB.

Dr. P. Rama Rao, Secretary, DST and Chairman RC inaugurated the Scientists' apartments built in the campus.

EPILOGUE

A conscious effort was made to sustain high professional standards, through research publications, seminars and interactions with experts. A large number of seminars and lectures, visits by eminent scientists and technologists provided an inspiring temper to the laboratory.

I wish to record our sincere appreciation for the support received from various Govt. depts., agencies and industry who have sponsored a large number of significant R&D projects in the areas of expertise available with RRL Bhopal. A close interaction with them has ushered in an era of meaningful R&D collaboration.

With the integration of existing R&D capabilities with interactions and involvement of user agencies, the Laboratory aspires to take up joint projects in the

areas of MMCs, squeeze casting, improvements in performance of c and mining implements and alternate housing materials. In tune wi targets for ECF are also expected to be achieved in the forthco 1993-94.

RRL Bhopal is specially indebted to Dr. P. Rama Rao, Secretary Chairman, Research Council, and the members of Research Council ing directions to the R&D endeavour.

I am personally grateful to Dr. S.K. Joshi, Director General, CSIR, for pr inspiring support to this laboratory. The guidance received from CSIR H ters has been very valuable to the Laboratory.

Scientists and staff of RRL Bhopal have put in hard and dedicated wo development and progress of the Laboratory.

Prof. T.C. Rao
Director, RRL, Bhopal

निदेशकीय

पूर्वपीठिका

क्षेत्रीय अनुसन्धान प्रयोगशाला, भोपाल की वार्षिक रिपोर्ट प्रस्तुत करते हुए मुझे अत्यंत प्रसन्नता का अनुभव हो रहा है। सन् 1992-93 की अवधि में प्रयोगशाला ने इन विविध क्षेत्रों के अंतर्गत कार्य किया।

भवन निर्माण - सामग्री

धातु विज्ञान एवं सामग्री

खनिज

संसाधन विकास

उक्त गतिविधियाँ निम्नलिखित उद्देश्यों को ध्यान में रखते हुए चलायी गयीं।

* उपभोक्ता एजेंसियों के साथ विकसित सम्पर्क
* प्रयोगशाला द्वारा विकसित उत्पादों/प्रक्रियाओं के पायलट/बड़े स्तर के ट्रायल्स में इस तरह की एजेंसियों, विशेषकर उद्योगों के समन्वयन का प्रयास।

परिणामस्वरूप लकड़ी की स्थानापन्न सामग्री से बने उत्पादों, कृषि एवं खनन उपकरणों के ट्राइबॉलॉजिकल अध्ययन, स्क्वीज कास्टिंग तथा स्क्वीज इनफिल्ट्रेशन पर आधारित मेटल मैट्रिक्स कम्पोजिट, एफ आर पी सामग्री, कोल प्रिपरेशन इत्यादि के क्षेत्र में अनेक संभावनाएं सामने आ रही हैं। इसके साथ ही प्रायोजित कार्यों से प्राप्त बाहरी धन प्रवाह की मूल राशि (स्वीकृत) जनवरी 1990 से 220 लाख से भी ऊपर पहुँच गयी है। आज हम एक ऐसी स्थिति में पहुँच गए हैं, जबकि प्रयोगशाला के पास समयबद्ध तथा उपभोक्ता एजेंसियों से समर्थित अनुसन्धान एवं विकास कार्यक्रम है।

प्रयोगशाला की अनुसन्धान एवं विकास गतिविधियों के विस्तृत विवरण इस रिपोर्ट में अन्यत्र प्रस्तुत हैं। यहाँ इन गतिविधियों के कुछ मुख्य बिन्दु प्रस्तुत हैं।

अनुसन्धान एवं विकास गतिविधियाँ

भवन-निर्माण-सामग्री

प्रौद्योगिकी सलाहकार मंडल (सामग्री विज्ञान एवं प्रौद्योगिकी) के तत्वाधान में सी एस आई आर एवं केन्द्रीय लोक निर्माण विभाग द्वारा संयुक्त रूप से "लकड़ी की स्थानापन्न सामग्री संबंधी कार्यक्रम" पर प्रयास किया गया। प्रयोगशाला द्वारा दरवाजों के लिए विकसित रेड मड पॉलीमर कम्पोजिट सामग्री ने विशेष रुचि पैदा की। रेड मड पॉलीमर कम्पोजिट सामग्री के इन दरवाजों का मूल्यांकन एवं परीक्षण केन्द्रीय भवन अनुसन्धान

संस्थान, रूकड़ी तथा केन्द्रीय लोक निर्माण विभाग द्वारा किया जा रहा है। प्रारंभिक परीक्षणों तथ ने इस उत्पाद की गुणवत्ता का समर्थन किया है। इन नए उत्पाद की विशिष्टताएँ संयुक्त रूप से लोक निर्माण विभाग तथा क्षेत्रीय अनुसन्धान प्रयोगशाला, भोपाल द्वारा निर्धारित की गयी है।

इस परियोजना से संबंधित एक अन्य विशेष उपलब्धि भवन निर्माण सामग्री के गुण-निर्धारण एक केन्द्र की स्थापना का निर्णय भी है, जिसमें वैकल्पिक सामग्री पर विशेष बल दिया जाएगा। मैटीरीयल्स एंड टेक्नॉलॉजी प्रमोशन काउन्सिल ने इस केन्द्र हेतु परीक्षण उपकरणों तथा अन्य सुवि लिए 28 लाख रु. का अनुदान दिया है। इस केन्द्र में लगभग 75 लाख क. की राशि के होंगे।

नेशनल बिल्डिंग ऑर्गनाइजेशन (एन बी ओ) एक प्रदर्शन भवन परियोजना में सहयोग कर र 15 लाख), जिसके अंतर्गत प्रयोगशाला परिसर में सोलह प्रदर्शन भवन निर्मित किए जायेंगे। इस परियोजना भोपाल द्वारा विकसित वैकल्पिक/नई सामग्री, संघटक तथा प्रौद्योगिकी सम्मिलित होंगी।

परती भूमि विकास के लिए फ्लाय एश के उपयोग की दसरी रोचक परियोजना (रु. 12 लाख थर्मल पावर कारपोरेशन द्वारा स्वीकृत की गयी है। इसके लिए प्रयोग रीहन्द नगर में किए जायेंगे।

धातुविज्ञान एवं सामग्री

प्रयोगशाला ने कृषि एवं खनन उपकरणों पर क्रमशः भारतीय कृषि अनुसन्धान परिषद् तथा स डी आइ एल की सहायता से ट्राइबॉलॉजिकल अध्ययन संबंधी परियोजनाओं पर कार्य प्रारंभ कि 45 लाख)। इन उपकरणों के जीवन एवं कार्य के विकास के उद्देश्य को लेकर चल रही यह परियोजना के मुख्य क्षेत्र में है। इस क्षेत्र में विशेषज्ञता को देखते हुए क्षेत्रीय अनुसन्धान प्रयोगशाला, भोपाल एवं प्रौद्योगिकी विभाग द्वारा स्थापित किए जाने वाले पाँच सरफेस इंजीनियरिंग एक्टिविटी सैटलाइ से एक के लिए चुना गया है।

व्यावसायिक स्तर के प्रौद्योगिकी विकास के लिए स्कीज कास्टिंग तथा स्कीज इनफिल्टरेटेड मे कम्पोजिट पर आधारित ऑटोमोटिव संघटकों पर उद्योगों के साथ संयुक्त रूप से परियोजनाओं पर करने की दिशा में प्रयास जारी हैं। 29.1.1993 को उद्योगों के प्रतिनिधियों एवं विशेषज्ञों के सम्पर्क बैठक में भावी कार्यक्रमों पर चर्चा की गयी। सिरामिक फाइबर प्रिफॉर्म्स पर मेसर्स ओ लिमिटेड, लखतर में सफलतापूर्वक कार्य किया गया। इस उत्पाद हेतु भारत एवं विदेशों में बाजार क देखी जायेंगी।

ई टी पी कॉपर वेल्डिंग, बॉंडिंग ऑफ व्हाइट मेटल टु थ्रस्ट बियरिंग तथा चेकिंग ऑफ ई इन्सुलेशन टेप्स पर बी एच ई एल, भोपाल के लिए तीन परियोजनाएँ पूरी की गयीं। बत कि इस विकसित वेल्डिंग प्रक्रिया को प्रयोग में लाकर बी एच ई एल, भोपाल द्वारा वर्ष में रु. की बचत की गयी। हायड्रोजनरेटर थ्रस्टपैड्स में डीबॉन्डिंग को रोकने के लिए प्रयोगशाला

दिए गये। बी एच ई एल, भोपाल के साथ नई परियोजनाएँ प्रारंभ करने के लिए सम्पर्क जारी है।

खनिज

म.प्र. विज्ञान एवं प्रौद्योगिकी परिषद के लिए बस्तर के निम्न स्तरीय टिन अयस्क तथा सागर तथा झाबुआ जिलों के रॉक फॉस्फेट की बेनेफिसिएशन स्टडीज पर दो परियोजनाएँ पूरी की गयीं।

फर्टिलाइजर खनिजों पर चल रहे कार्य की प्रगति का विश्लेषण श्री सी पी एस नायर, भूतपूर्व तकनीकी सलाहकार, खनिज विभाग, तथा भारतीय भूवैज्ञानिक सर्वेक्षण एवं म.प्र. राज्य खनिज मंडल के विशेषज्ञों के सहयोग से किया गया।

यहाँ यह उल्लेखनीय है कि हीरापुर (सागर जिला) की रॉक फॉस्फेट में P_2O_5 की मात्रा 30 प्रतिशत तक (10-12 प्रतिशत की निम्न मात्रा से बढ़कर) तथा SiO_2 की मात्रा कम होकर 10 प्रतिशत तक प्राप्त की जा सकती है।

क्षेत्रीय अनुसन्धान प्रयोगशाला, हीरापुर सी ब्लॉक में बसई में रॉक फॉस्पेट के 7 मीटर निक्षेपों पर प्रारंभिक अध्ययन प्रारंभ करने जा रही है। भारतीय खान ब्यूरों, अजमेर में रॉक फॉस्फेट के बेनेफिसिएशन के पायलट प्लांट अध्ययन हेतु प्रारंभिक प्रयास भी किए गए है। टिस्को जमशेदपुर, हिन्दुस्तान जिंक लिमिटेड तथा पी पी सी एल के लिए भी लघु अवधि कंसल्टेंसी कार्य किए गए हैं।

संसाधन विकास

होशंगाबाद जिले के दलदली क्षेत्रों में फील्ड इनवेस्टिगेशन का कार्य किया गया। इस अध्ययन से प्राप्त नीतियों पर अमल के लिए राज्य शासन की एजेंसियों से सम्पर्क के प्रयास किए जा रहे हैं। दलदल की बढ़ती समस्या के निवारण हेतु केवल इसी प्रकार का एक माइक्रो लेवल अध्ययन खरार ग्राम में भी किया जा रहा है।

इस क्षेत्र में प्रयोगशाला द्वारा प्राप्त की गयी विशेषज्ञता तथा संभावित गतिविधियों पर ध्यान दिया जा रहा है तथा भूजल संदूषण के क्षेत्र में कार्य प्रस्तावित है। इस संदर्भ में कनाडा के वाटरलू विश्वविद्यालय के प्रो. जे पी ग्रीनहाउस प्रयोगशाला का दौरा कर रहे हैं।

"भूजल संसाधन मॉडलिंग तथा भूजल संदूषण" पर अप्रैल 93 में एक लघु अवधि कार्यक्रम तथा राष्ट्रीय कार्यशाला का आयोजन किया जा रहा है।

समाजोन्मुख कार्यक्रम

इस दिशा में प्रयोगशाला निम्नलिखित क्षेत्रों में कार्यरत है।

* पिछड़े क्षेत्रों में पारंपरिक धातु आधारित उद्योग
* कम लागत के भवनों का विकास
* ब्लॉक स्तर पर ग्राम को एक इकाई के रूप में लेने हुए प्राकृतिक संसाधन डाटा प्रबंध प्रणाली।

पिछड़े क्षेत्रों, विशेषकर मध्य प्रदेश के बस्तर क्षेत्र में धातु आधारित उद्योगों के लिए विकसित
के प्रशिक्षण एवं प्रदर्शन कार्यक्रम भी आयोजित किए जा रहे हैं। मध्य प्रदेश के पिछड़े इलाकों में
तकनीक के विकास हेतु एक परियोजना भी पूरी की गयी है।

अनुसन्धान मार्गदर्शन एवं तकनीकी सेवाएं

मध्य प्रदेश के धातु आधारित उद्योगों की अनुसन्धान एवं विकास आवश्यकताएं विषयक एक
संगोष्ठी (जनवरी 92) तथा तत्पश्चात एक दिवसीय क्षेत्रीय अनुसन्धान प्रयोगशाला उद्योग सम्पर्क बैठक
92) (विवरण बाद के खंडों में) के बाद प्रयोगशाला ने धातु विज्ञान एवं सामग्री विभाग की गतिविधियों
विशेष क्षेत्रों के रेखांकित करने का प्रयास किया है। एक संघ की स्थापना के माध्यम से सूचना
तकनीकी सेवाएं, तथा अनुसन्धान सहायता प्रदान करने का विचार है। इस प्रकार आदान-प्रदान हेतु
से सम्पर्क कर रहे उद्योगों के साथ पहले से ही कार्य जारी है।

अन्य क्षेत्रों, उदाहरणार्थ - खनिज, कोल बेनेफिसिएशन तथा भवन निर्माण सामग्री इत्यादि में
तरह के प्रयास किए गए हैं। सारणी ताप विद्युत गृह में किए जाने वाले विफलता परीक्षणों हेतु म
विद्युत मंडल ने प्रयोगशाला को एक समग्र सी एस आई आर समिति के सदस्य के रूप में
किया।

क्षेत्रीय अनुसन्धान प्रयोगशाला ने 18 दिसंबर, 1992 को राष्ट्रीय खनिज विकास निगम, है
साथ एक पंचवर्षीय अनुबंध किया। इस अनुबंध के अनुसार क्षे.अ.प्र. एक्स रे डिफ्रेक्टोमीटर त
इलेक्ट्रॉन माइक्रोस्कोप विश्लेषण पर आधारित राष्ट्रीय खनिज विकास निगम को प्रदान करेगी।

इस अवधि में म.प्र. में बड़ी संख्या में उद्योगों एवं संस्थानों को परीक्षण एवं परामर्श से
की गयीं।

आधारभूत सुविधाएँ तथा परिसर विकास

वर्तमान विज्ञान एवं प्रौद्योगिकी संबंधी आधारभूत सुविधाओं में, विशेषकर इन सुविधाओं के आ
तथा विकास को ध्यान में रखते हुए, कई अन्य सुविधाएँ जोड़ी गयीं। एक्स आर डी-ए पी डी
भी प्राप्त किया गया।

अतिरिक्त स्थान के लिए प्रयोगशाला भवन में कई परिवर्तन लगभग समाप्ति पर हैं। बिजली
प्रदाय की सुविधाओं सहित अन्य सेवाएँ भी विकसित की गयी। म.प्र. विद्युत मंडल के अध्
एल नेने द्वारा प्रयोगशाला में 33 किलोवाट के सबस्टेशन का उद्घाटन किया गया।

विज्ञान एवं प्रौद्योगिकी विभाग के सचिव तथा अनुसन्धान परिषद के अध्यक्ष डॉ. पी रामाराव
परिसर में निर्मित वैज्ञानिक अपार्टमेन्ट का उद्घाटन हुआ।

उपसंहार

विशेषज्ञों से सम्पर्क, संगोष्ठियों तथा शोध प्रकाशनों इत्यादि के माध्यम से उच्च व्यावसायिक प्रतिमान स्थापित करने का एक सजग प्रयास किया गया है। बड़ी संख्या में संगोष्ठियों, प्रतिष्ठित वैज्ञानिकों तथा प्रौद्योगिकी विदों द्वारा दौरों तथा व्याख्यानों से प्रयोगशाला में प्रेरणास्पद वातावरण निर्मित हुआ है।

मैं क्षे.अ.प्र., भोपाल की विशेषज्ञता के क्षेत्रों में महत्वपूर्ण अनुसन्धान एवं विकास परियोजनाएं प्रायोजित करने वाले उद्योगों, शासकीय तथा एजेंसियों से प्राप्त सहयोग के लिए उनको साधुवाद देता हूँ। उनके साथ सम्पर्क ने सार्थक अनुसन्धान एवं विकास सहयोग को जन्म दिया है।

वर्तमान में उपलब्ध अनुसन्धान एवं विकास क्षमताओं तथा उपभोक्ता एजेंसियों के साथ सम्पर्क के समन्वय को देखते हुए प्रयोगशाला धातुविज्ञान एवं सामग्री, स्कीज कास्टिंग, कृषि एवं खनिज उपकरणों की क्षमता में विकास तथा वैकल्पिक भवन निर्माण सामग्री के क्षेत्र में संयुक्त परियोजनाएं प्रारंभ करने के लिए प्रयासरत है। इसी के साथ 1993-94 में बाहरी धन प्रवाह हेतु निर्धारित लक्ष्य प्राप्त करने की भी संभावना है।

क्षेत्रीय अनुसन्धान प्रयोगशाला अनुसन्धान एवं विकास प्रयासों के लिए प्राप्त मार्गदर्शन हेतु विशेष रूप से विज्ञान एवं प्रौद्योगिकी विभाग के सचिव तथा अनुसन्धान परिषद् के अध्यक्ष डॉ. पी रामाराव एवं अनुसन्धान परिषद् के सदस्यों की आभारी है।

मैं वैज्ञानिक एवं औद्योगिक अनुसन्धान परिषद् के महानिदेशक डॉ. एस के जोशी का व्यक्तिगत रूप से आभारी हूँ, जिनसे प्रयोगशाला को प्रेरणादायक सहयोग प्राप्त हुआ। परिषद् मुख्यालय से प्राप्त दिशानिर्देश प्रयोगशाला के लिए अत्यधिक मूल्यवान रहे।

क्षेत्रीय अनुसन्धान प्रयोगशाला के वैज्ञानिकों एवं अन्य कर्मचारियों ने प्रयोगशाला के विकास एवं प्रगति की दिशा में समर्पित एवं कठिन कार्य किया है।

टी सी राव

प्रो. टी सी राव
निदेशक
क्षे.अ.प्र., भोपाल

Seventh Research Council Meeting (10-10-92) in Session

Dr.P. Rama Rao, Secretary, DST and Chairman, RC, inaugurated Scientists' Apartments in the Campus.

PC-APD Software facility has been added on X-Ray Diffraction

RMP panel doors fixed on Director's Office

PROJECT DETAILS

PROJECT DETAILS

BUILDING MATERIALS DIVISION

Research areas of this division are

* Development of low cost/alternate building materials, components e.g. sisal cement roofing sheets, panels, bricks etc.,
* Demonstration low cost housing units,
* Fly ash, red mud utilisation.

This division has a committed external cash flow of over Rs.84 lakh since Jan.'90. Research programmes in this division have evolved from the strong linkages built with Ministry of Urban Development, Building Materials Technology Promotion Council, HUDCO, NBO, NTPC, MPCOST and M.P. State agencies. Ongoing projects in the division are shown in Table-I.

Table-I : Ongoing Projects

Sponsor	Project Title
NTPC	Laboratory trials for manufacture of clay ash bricks wit pond ash and fly ash
MOUD	Pilot plant studies of sisal fibre cement roofing sheets
MOUD	Construction of low cost demonstration houses
MOUD	Low cost cementitious binder from industrial waste `r
MPCOST	A study on mechanical properties of sisal fibre produ MP
BMTPC	Development of sisal red mud polymer composites fo components as wood substitute
BMTPC	Centre for Characterisation of Building Materials
NTPC	Pilot project for waste land development
NBO	Construction of 16 proto-type houses using innovati construction techniques and materials by RRL
NBO	Development of ipomoea polymer components

Clay fly ash bricks

For two thermal power stations at Korba and Rihand Nagar of NTPC the RRL has trials of clay fly ash bricks.

In consultation with NTPC, sites for brick plants were identified. The soil and ash samples were analysed for chemical composition, X-ray studies, IR spectrometry, SEM, DTA, particle size and plasticity limits.

Bricks of compressive strength between 90 and 160 Kg/cm^2 and water absorption 13-22% can be made by using 40-60% ash with Korba soil.

Red mud polymer (RMP) doors

A combination of red mud and sisal fibres in polymer matrix as alternate material for building components like doors and panels has been tried. Door panels (3mm thick) of this composite has shown equivalent flexural strength of a 10-12 mm thick plywood (510kg/cm^2). The unique feature is the use of natural fibres in place of the expensive glass fibres.

Extensive studies on bond strength, chemical resistance, weathering, and thermal properties have been undertaken.
The material holds promise as a potential candidate in construction materials alternate to wood.

Consequent upon the decision of "Apex Group"on Wood Substitutes, to take up work on alternate "door shutters" for CPWD, RRL Bhopal was identified for development of following products :

* Red mud polymer hollow core door, plane surfaced (without frame).

* Interpenetrating polymer network (IPN) rigid foam core shutters with red mud polymer facing (without frame), in association with IICT Hyderabad.

RRL Bhopal met the targets to supply thirty doors to CPWD for field trials an doors to CBRI Roorkee for performance and other tests. Similar hollow c were made for IICT Hyderabad, where the core was filled with IPN rigi

The door units are undergoing field trials under auspices of CPWD installed at the GB Pant Hospital, New Delhi. Preliminary tests/trial results the red mud polymer door as a promising product.

With the decision to ban the use of wood in construction with effect f 1993, the CPWD have listed the RMP door in the category of new techn

Centre for characterization of building materials

RRL is setting up this centre with the following objectives :

a) appropriate codification of alternate materials/component of properties, methods of processing etc. and

b) standard evaluation practices for these materials.

The proposed centre at RRL Bhopal, recommended by the Apex Wood Substitutes, aims to fulfill the need for an expanded base for te certification.

Expeditious testing, with reference to the specifications drawn for materials, would be of paramount importance to enable technolog and large scale adoption.

It is heartening to report that the Building Materials Technology Council (BMTPC) of the Ministry of Urban Development has sanctione of Rs.28.00 lakh for testing equipment for the centre.

METALLURGY AND MATERIALS DIVISION

R&D activities of this division include the following :

* Aluminium based metal matrix composites, squeeze casting and squeeze infiltration
* Material characterization
* Wear related problems in mining and farm implement
* Engineering failure analysis
* Welding techniques
* Corrosion
* Fibre reinforced polymer materials

This division has a committed external cash flow of over Rs.80 lakh since Jan.'90. During 1992-93, commensurate with the activities, the division has had impressive linkages with prestigious organisations. These include BHEL, HZL, BALCO, CMPDIL, ISRO, VRDE, DMRL, CBIP, MPEB, ICAR, CIAE and a large number of industries in and around M.P.

Table-II shows the ongoing assignments in the division. Completed projects are listed in Table-III.

Table-II : Ongoing Projects

Sponsor	Project Title
BHEL	Development of suitable FRP material for gear co make prototype gear case for Traction Motor
BHEL	Development of squeeze casting process for half c
ISRO	Development of aluminium metal matrix composite space application
OCL	Process development on a semi commercial level f preforms
MPCOST	Development of suitable grinding media for cemer
MPCOST	Studies on corrosion of modified cast irons
DST	Structure and properties of advanced high tempe minium base alloy through rapid solidification proc
MPCOST	Process development for manufacture of bonded rapidly solidified Nd-Fe-B alloys
MPCOST	Training programme on bell metal technology in Bo Alwi village
ICAR	Metallurgy and process development for quality u for better performance of critical parts of Agriculture
CMPDIL	Improving life of mine implements through tribolog
CBIP	Characterisation of fly ash from ten thermal powe

Table-III : Completed Projects

Sponsor	Project Title
BHEL	Process improvement of welding annealed copper used as squirrel cages ends-rings for AC machine
BHEL	Analysis of bonding of white metal for hydrogenerator thrust bearing
BALCO	Effect of inclusion content on the mechanical properties & deep drawability of Al-alloys.
BALCO	Tensile properties of Al-alloys at elevated temperature
MPCOST	Utilisation of blue dust of Bailadila as a starting material to develop hard ferrites
MPCOST	Improvement in the life of farm implements through wear studies
DMRL	Development of a process to make high integrity casting of Al-alloy silicon carbide particle composites
MPCOST	Quality upgradation of Blacksmithy technology in rural and tribal areas.

Quality and productivity improvement of ETP copper welding

Electrolytic Tough Pitch (ETP) copper end rings are used for squirrel
Machines. BHEL Bhopal sponsored an assignment to enable reduc
tion rates in welding of ETP copper welding. With the impro
proposed by RRL, using Gas Metal Arc Welding (GMAW) proce
rejection rates have been possible. BHEL has reported an estimat
Rs.28 lakh annually.

Bonding of white metal pad to mild steel in hydrogenerator thr

The programme was undertaken for BHEL Bhopal with the dual
ascertaining the liner debonding mechanism, especially with ag
suggest improved tinning and babitting methods to overcome th

Results of the investigation indicate that it is possible to obtain
bonding of babbitt metals with mild steel pads by adopting certain
ary measures and modifying the existing process adopted by BHEL
strated the modified process of making bi-metallic thrust bear
Bhopal. Further, it was also made possible to successfully repair th
surfaces babbitted with INDO:84 alloy which was earlier reported

Checking sodium etching on PTFE tapes

BHEL Bhopal sponsored a project on "Development of method
sodium etching on PTFE tapes." The two methods suggested
conducting quality checks are significant and unique. BHEL impo
to the tune of Rs.10.00 lakh annually.

High integrity castings of aluminium alloy-silicon carbide p
posites

High integrity castings of composites consisting of silicon carbide
dispersed in the matrix of an aluminium alloy (AA 2124) have bee
The particles of SiC were dispersed in the Al-alloy melt by vortex te

composite melt containing 10 and 20 wt% SiC particles (size 50-100 m) was cast in permanent cast iron cylindrical moulds in the form of 50 mm diameter and 150 mm long castings. Squeeze casting technique, wherein pressure is applied during solidification, was also employed in addition to gravity casting in order to get castings with improved soundness. RRL carried out this work successfully for DMRL Hyderabad under a sponsored project.

Studies on aluminium alloys

Two projects were carried out for BALCO, Korba on following topics:

- Tensile properties of Al-alloys (ISS:617,1975 BSS:LM 13) at appropriate elevated temperature and heat treatment cycles for the same.

- Effect of inclusion content on mechanical properties and deep drawability of Al-alloys.

Based on the work carried out by RRL, recommendations have been made and these are expected to augment existing information and processing capabilities for quality assurance.

Improvement in the life of farm implements

A number of farm implements and steels were investigated in order to find out their optimum wear and mechanical properties attained by them through microstructural changes. Results indicate that the implements made from low carbon steel such as sweep type blade of wheel-hole and khurpa can attain improved mechanical properties with only marginal improvement in wear resistance. On the other hand, steels other than mild steel, used for the manufacture of implements such as tiller blade, reaper blade etc., can suitably be heat treated for attaining improved mechanical and wear properties.

An improvement in the mechanical and wear properties of the order of 25 to 60% can be achieved in the existing implements by bringing about suitable microstructural changes in the medium carbon steel used for the purpose. The project was supported by MPCOST.

MINERALS DIVISION

Main R&D activities of this division are built around the following :

* Beneficiation of low grade ores,

* Utilisation of some fertilizer minerals of MP,

* Studies of utilization of aluminium silicate minerals for developing mullite and other value added ceramic materials,

* Beneficiation techniques and modelling studies related to coal and mineral preparation processes.

The division has attracted external funding of about Rs.50 lakh since Jan.'90. Major linkages of this division are with Dept. of Mines, IBM, GSI, MPCOST, M.P. State Mining Corporation, TISCO, HZL, PPCL and CMPDIL.

Tables IV and V show the ongoing and completed projects respectively.

Table-IV : Ongoing Projects

Sponsor	Project Title
DOM	Beneficiation and industrial utilisation of some fertilizer r MP
TISCO	Modelling & performance studies on Vorsyl Separator
MPCOST	Studies on proper utilisation of Narmada sand of MP
DST	Exploratory investigation on utilisation of flyash for ceramics
TISCO	Beneficiation for studies of Sijua group coal fines using Cyclones
TISCO	Feasibility studies to reduce the alumina content in Noa ore slimes using Multi Gravity Separator
TISCO	Studies on steel plant wastes and as an alternate heavy HM separation of Coal
HZL	Modelling studies on a Pb-Zn ore grinding circuit
HZL	Test work on Multi Gravity Separator for the treatme rougher concentrate - Rajpura Dariba Mines
CMPDIL	Modelling and scale up studies in water only cyclone tr

Table-V : Completed Projects

Sponsor	Project Title
MPCOST	Beneficiation studies of tin ore of MP
MPCOST	Exploitation of some fertilizer minerals of MP
PPCL	Beneficiation studies on pyrites cinder
CMC	CMC advisory work

Beneficiation and industrial utilisation of fertiliser minerals of MP

This programme is run with support from Deptt. of Mines, Govt of India, MPCOST and in technical association with IBM and MPSMC.

Encouraging results have been obtained on beneficiation of siliceous rock phosphate from Hirapur. P_2O_5 content upto 30% (from as low as 10-12%) and SiO_2 content reduction to less than 10% have been possible. Pilot plant trials are being planned with the association of Indian Bureau of Mines.

Similarly, it has been possible to keep MgO content below 1% while working with dolomatic rock phosphate, as required by the fertilizer industry.

Work on calcareous rock phosphate is also underway. A final phosphate concentrate assaying a composite grade of 27% P_2O_5 and composite P_2O_5 recovery of 74.7% has been produced. These grades are suitable single super phosphate and triple supper phosphate.

Beneficiation studies on low grade Tin ore of MP

The results with pegmatitic ore show that a concentrate having sub values can be produced on Mozley Mineral Separator using the V-p The study carried out on soil type ore reveals that the desliming st actual concentration process would reduce the material to be treate 50%, wherein the loss of tin values will be only 7.95% of the total tin pre feed. Treatment of the coarse fraction on V-profile tray of MMS has concentrate with a grade of maximum of 25% tin and the recovery is o only. The final concentrate (non-magnetic fraction) consists prec cassiterite which contains 38.6% tin with an overall recovery of 7 project was supported by MPCOST.

Preliminary beneficiation studies on pyrite cinder

Pyrite cinder waste sample sent by M/s Pyrite, Phosphates and Che was examined in the present work for enrichment of iron content.

The pyrite cinder waste containing 34.30% Fe_2O_3 can be treated to concentrate containing 54.35% Fe_2O_3 with 66.20% recovery by simp classification-gravity concentration circuit. The grade and recovery be further improved by conducting detailed studies on further liberat tuning of other variables of Multi Gravity Separator.

Exploratory investigations on fly ash as a raw material fo ceramics

This investigation, supported by DST, is aimed at exploring the p synthesis and evaluation of α - sialon of high purity from fly ash. St ash characterization for chemical and mineral composition, particle tion and microstructural features have been carried out. Carbothe tion (CTR) of specified raw material in nitrogen atmosphere was car reaction products after suitable pretreatments were studied by XRD

The studies indicate that fly ash can be converted to make ceramic powders containing mullite with SiC, α-Al_2O_3 with SiC, and AlN with SiC and Sialon. Evaluation of mechanical and tribological properties of sintered products is planned with a view to identify suitable applications.

Coal preparation

MP is rich in non coking coal reserves. These are high ash coals and pose problems during combustion in boilers. Though awareness and importance of dry cleaning of non-coking coals is increasing no attempt has been made so far in India to beneficiate non-coking coals using these inexpensive techniques.

Programmes of the Laboratory in this area aim to address to coking coals and non-coking coals. These are mentioned below:

- Modelling and performance studies on Vorsyl separator
- Studies on entrainment in forth flotation of coal fines
- Comparison of and modelling studies on centrifugal heavy separators

Modelling and performance studies on Vorsyl separator

Experiments were carried out on a three inch dia heavy medium cyclone to compare its performance with Vorsyl Separator. The new test-rig received under this project was installed with the laboratory three inch heavy medium cyclone Effect of the following on its performance have been studied in the present investigation.

- Feed specific gravity and
- Spigot diameter

The tests conducted on both Vorsyl separator and heavy medium cycl shown similar effects of the variables studied on yield and ash of the cl

The generalised distribution curve for these two units illustrate the hig ness of separation, in terms of Epg, for the Vorsyl separator. The yield of c obtainable at any ash level is always higher in the Vorsyl Separator as c to heavy medium cyclone. Installation of plant scale Vorsyl separat Bokaro washery and preliminary tests are proposed to be taken up s

Studies on Narmada sands of MP

Narmada sands are mainly used for civil constructions and in non-fer as iron foundries. These sands are not being used for steel castings b their low silica content and other chemical compositional restrictions this project is to beneficiate the Narmada sands economically to mak for use in steel foundries.

BHEL, Bhopal showed interest in obtaining a larger quantity of the be sand for trials in the shop-floor and accordingly about 400kg of be sand prepared in the Laboratory was provided.

RESOURCES DEVELOPMENT DIVISION

Resources Development Division of RRL, Bhopal has active R&D programmes in water resources management. The division has mandate to carry out computer aided studies in integrated ground and surface water resources systems management. Main capabilities of the Laboratory exist in mathematical modelling and systems analysis. Table-VI shows the ongoing projects in this area.

Table-VI : Ongoing Projects

Sponsor	Project Title
DST	Groundwater evaluation through modelling in the area of Tawa river basin
DST	Development of true groundwater surface with the help of mathematical modelling
MPCOST	Development of basin wise database for the state of MP

The Laboratory plans to extend the activities for development of gr database management system, and geographical information sys cations to water resources management.

The new projects on anvil are i) Groundwater balance studies in da Sanwer Block, Indore Dist. ii) Groundwater contamination movemen in Son river basin, Shahdol Dist.

Groundwater resources management through modelling in Ta Command Area, Hoshangabad Dist., MP

This study deals with groundwater resources management through m the Tawa canal command area by understanding the dynamic b the groundwater regime with changing inputs and outputs.

Field surveys were conducted during premonsoon and postmonsoo collect water table data and water samples at these observation p the year.

Based on the water table data the areal extent of water-logging du monsoon and post-monsoon seasons is delineated (Table-VII).

Table-VII Water-logged areas in Sq. Km.

Year	Pre-monsoon	Post-monsoon
1989	Not Computed	88.75
1990	37.5	354.475
1991	58.75	362.93
1992	75.375	370.25

The total study area is divided into three sub-areas based on t boundaries. It is observed that non-monsoon recharge is significant monsoon recharge,due to canal seepage. The non-monsoon Hoshangabad block is much higher than monsoon recharge and c compared to other blocks for a smaller area. This may be due t

capacities of the distributaries that are passing through the Hoshangabad block. The total groundwater recharge and net recharge for the total area are 381.97 MCM and 324.62 MCM respectively. The groundwater balance is estimated as 195.55 MCM after deducting the total draft of 113.5 MCM.

It is indicated that on an average there is a dynamic storage of 1.1 m which may be used for irrigation. If 195.55 MCM of water is discharged from the aquifer and an equivalent quantum of surface water irrigation is curtailed, the magnitude of water-logging can be reduced to great extent, provided the other recharge and discharge components remains same.

Modelling studies based on numerical solution through finite-difference approach and an iterative alternative direction implicit (IADI) method is used to solve the set of equations.

The study area is approximated by finite difference square grids consisting of 35 X 21 grids in longitudinal and latitude directions respectively. The grids are divided at an interval of 1.0 cm on a 1:250000 scale map.

This model is being calibrated taking into consideration of the data for the period 1983-88 and the parameters for each node are being evaluated.

To study the efficacy of the various schemes for alleviating the water-logging, it is proposed to conduct some field trials. The State Govt. has agreed to extend the support for carrying out the field trials.

The area around Kharar village between the Damadia and Makdai distributaries is chosen for the same. A work plan to understand the water-logging mechanism at micro-level and to study the suitability of different remedial schemes is prepared.

GENERAL INFORMATION

GENERAL

L.S. Jha Award for Prof. T.C. Rao

Pandit Lajja Shankar Jha Award instituted by Madhya Pradesh State Government for contributions to the field of Engineering and Technology, was conferred on Prof. T.C. Rao, Director, Regional Research Laboratory, Bhopal. The Hon'ble Chief Minister of Madhya Pradesh, Shri Sunderlal Patwa, presented the Award to Prof. Rao at an investiture ceremony held on June 26, 1992. The Award consists of a citation and a cash Award of Rs. 50,000.00

A recipient of the National Mineral Award and the National Metallurgist Day Award, Prof. Rao has important contributions in the field of characterisation and model development of industrial hydrocyclones and comminution circuits. He has also contributed in the field of modelling of coal washeries. His work on coal washery slurries and modelling of coal preparation operation is well known all over the world. He has worked for improvement of the capacities of two coal washeries and a copper concentrator which have given high profit to two public sector mineral and coal industries.

The citation makes a special reference to Prof. T.C. Rao's endeavour in giving a vibrant leadership to RRL Bhopal since 1989-90.

Industry-RRL Bhopal Interaction Meeting

Department of Scientific & Industrial Research, Ministry of Science & Technology, New Delhi invited RRL Bhopal to conduct this Interaction Meeting. The meeting addressed to the theme of metallurgy and material science keeping in view the strength of the Laboratory and its aspiration to extend its capability and technical services to the Industry in an around Madhya Pradesh. Over seventy delegates from industry and institutions attended this meeting.

Hon'ble Minister of Industries & Commerce M.P. Shri Kailash Joshi inaugurated the meeting on August 27, 1992. Shri P.K. Baijal, Secretary, Industries M.P., delivered the keynote address. Dr. V.V. Subba Rao, Joint Adviser, DSIR, spoke on

the Industry R&D linkage. Senior representatives from M.P. Chambe merce and Industries Associations addressed on the R&D needs of the

In addition to identifying some specific problems on which the Laborat interact with industry, a major resolution for a formation of Industry-R tium was unanimously adopted.

The Laboratory is taking further steps in formalising the consortium w senior representatives from Industry Associations, Chamber of Comm the State Industries Department.

CSIR Foundation Day Celebrations 1992

Dr. S. Varadarajan, Former Director General, CSIR inaugurated the C dation Day - 1992 celebrations. Speaking on the occasion he made appeal to nurture creative thinking and innovative approach programmes of development with a particular reference to the bou of Madhya Pradesh. Sustainable development, integration of ap technological advances, and a conscious effort to conserve enviro be the guiding principles for meaningful development in the years

Documentation of valuable information on all the resources of the pertinent need of the hour. R&D institutions like the RRL Bhopal, the sta of Science & Technology and other state agencies should address t immediately. This assumes a particular significance in the wake of pr decentralised planning process.

Dr. Varadarajan during his talk dwelt with a whole gamut of whic technological developments in the fields of agriculture, forestry technology, chemical industry, energy & mining, and metallurgical said environmental awareness blended with appropriate pollutio methodology, innovative processing technologies aimed at zero many of these sectors, are going to be the most important en mankind.

On this occasion mementos were presented to Shri S.P. Mukherjee, Scientist, who superannuated this year and also to Shri Ram Naresh Ram on completion of 30 years service in CSIR. Shri A.C. Khazanchi received CSIR Golden Jubilee mementos on behalf of all the regular staff of the Laboratory.

The cash awards of Rs.3000 each were given to three students belonging to Scheduled Caste and three students belonging to Scheduled Tribes, who passed the class X examination of the M.P. Board of Secondary Education in 1992 with high marks in Science subject.

The Laboratory organised various Essay and Quiz competition for the children of the staff members. The winners were given prizes.

Later the Laboratory observed Open Day'. Over three hundred students, engineers, industrialists and general members of the public visited the various facilities of the Laboratory and were explained the R&D activities.

Visit of Experts from Ukraine

Professor V.V. Panasyuk, Director, Karpenko Physico Mechanical Institute, Lviv, Ukraine led a three member team to visit the Laboratory on Jan 31, Feb 1, 1993. Prof. Alexander Ye Andreykiv and Dr.(Ms) Natalia Kuznyak were other experts in the team. Dr. S.P. Kulsreshta, Director, DST, accompanied them. For activities under the Indo-Ukrainian Cooperation Programme Projects were identified in the areas of tribology studies and coal beneficiation techniques. The team expressed deep appreciation of the Laboratory expertise and facilities in these areas.

Visits Abroad

Dr. Kunal Basu visited University of Wisconsin at Milwaukee, University of Maryland at College Park, New Mexico Tech at Socorro and University of California at Irvine, four well-known educational institutions in U.S.A. under NSF-CSIR exchange of Scientists program for six weeks, during May 8th to June 22nd 1992.

Dr.(Ms) Mohini Saxena visited U.K. between 16th July and 3rd Aug During this period she attended the "RILEM International Symposiu Reinforced Cement and Concrete" at University of Sheffield. Besides the work on Sisal Cement Composites on Alternates to Asbestos, Imperial College, London, and Building Research Establishment, Wo also delivered technical lectures.

Mr. L. Sanjeeva Rao visited Institute of Processing and Utilisation of M Materials, University of Mining and Metallurgy, Krakow, Poland and In Chem. and Metallurgy of Rare Elements, Technical University of Wroclaw, Poland, under Indo-Polish Scientist Exchange Programme knowledge on raw methodologies in modelling and process control mineral and coal preparation areas.

Mr. O.P. Modi has been nominated for training in U.K. in the field of Po Research Course in characterisation of coal for a period of six month March to 20th September, 1993 at the Department of Mineral Reso neering, University of Nottingham.

National Seminar on Alternate Housing Materials

A two day "National Seminar on Alternate Housing Materials" was he 12-13, 1993. The seminar was jointly organised by RRL, Bhopal, MP Science and Technology and the Materials Research Society of Bhopal Chapter. Shri M Natarajan, Adviser to Governor of MP, inau Seminar. Dr. J.G. Negi, Director General, MPCOST, delivered th address. A large number of papers were presented during technica experts from various organisations. The seminar, tool stock of t research activities in the area with specific reference to the need of improved efficiency.

National Safety Day

National safety day was observed at the Regional Research Labora on March 4, 1993 by taking safety pledge by all the employees of th On the occasion, Dr. DP Singh, OSD of Disaster Management Inst delivered a lecture and a film on Disaster Management and Sa screened.

Prof. T.C. Rao, Director
Regional Research Laboratory, Bhopal
receiving the Pt.L.S. Jha Award *from*
Shri Sunderlal Patwa, Chief Minister of Madhya Pradesh

Industry-RRL Bhopal Interaction Meeting was inaugurated b
Shri Kailash Joshi, Minister of Industries & Commerce, MP
on August 27, 1992.

Participants of the Industry-RRL Bhopal Interaction Meetin
in the Resources Development Division.

Dr.S. Varadarajan, Former DGSIR, Inaugurated CSIR Foundation Day Celebrations '92.

Shri AC Khazanchi, Dy. Director, receiving ***CSIR Golden Jubilee Mementoes*** *on behalf of RRL Bhopal Staff from Dr.S. Varadarajan.*

APPENDICES

APPENDIX - 1

RESEARCH COUNCIL

Prof. P. Rama Rao — **Chairman**
Secretary,
Department of Science & Technology,
Technology Bhawan,
New Mehrauli Road,
New Delhi-110 012.

Shri A.C. Wadhawan — **Member**
Chairman-cum-Managing Director,
Hindustan Zinc Limited,
Udaipur.

Shri C.P.S. Nair — **Member**
Chief Technical Advisor,
Dept of Mines,
Min. of Steel & Mines,
Shastri Bhawan,
New Delhi-110 001.

Dr. D.N. Misra — **Member**
Director General,
Madhya Pradesh Council of Science & Technology
Maharana Pratap Nagar
Bhopal-462 011.

Prof. H. S. Ray — **Member**
Director,
Regional Research Laboratory,
Bhubaneswar-751 013.

Shri M.I. Beg — Membe
Central Electricity Authority
Seva Bhawan,
R.K. Puram,
New Delhi-110 066.

Shri S.K. Handa — Membe
Executive Director
BHEL, Bhopal.

Dr. T.N. Gupta — Membe
Consultant,
Ministry of Urban Development,
G-Wing, Room No. 116
Nirman Bhawan
New Delhi-110 001.

Dr. T.R. Ramachandran — Membe
Director,
Jawaharlal Nehru Centre for Aluminium Research,
Design and Development
Mohta Apartments,
Katol Road, Chawani,
Nagpur-440 013.

Dr. O.N. Mohanty — DGSIR
Scientist,
National Metallurgical Laboratory,
Jamshedpur-831 007.

Prof.T.C. Rao — Membe
Director,
Regional Research Laboratory,
Bhopal-462 026.

Dr. R.N. Yadava **Secretary**
Scientist,
Regional Research Laboratory,
Bhopal-462 026.

During 1992-93 Sixth and Seventh meetings of the RC were held on April 4, and October 10, 1992 respectively.

MANAGEMENT COUNCIL

Prof. T.C. Rao — Chairm
Director,
Regional Research Laboratory,
Bhopal-462 026.

Dr. A.D. Bhide — Memb
Scientist,
National Environmental Engg. Research Inst.
Nehru Marg,
Nagpur-440 020.

Dr. R.B. Hajela — Memb
Scientist,
Central Building Research Institute,
Roorkee-247 667.

Dr. Kunal Basu — Memb
Scientist,
Regional Research Laboratory,
Bhopal-462 026.

Shri. B.K. Saxena — Memb
Scientist,
Regional Research Laboratory,
Bhopal-462 026.

Dr. C.B. Raju — Memb
Scientist,
Regional Research Laboratory,
Bhopal-462 026.

Mrs. Alka Meshram Scientist, Regional Research Laboratory, Bhopal-462 026.	**Member**
Finance & Accounts Officer Regional Research Laboratory, Bhopal-462 026.	**Member**
DGSIR or his Nominee CSIR Head Quarters New Delhi-110 001.	**Permanent Invitee**
Controller of Administration, Regional Research Laboratory, Bhopal-462 026.	**Member Secretary**

The Management Council Meetings were held as under:

9th Meeting on April 6, 1992

10th Meeting on July 3, 1992

11th Meeting on September 11, 1992

12th Meeting on January 8, 1993

DISTINGUISHED VISITORS

Hon'ble Minister of Industries & Commerce M.P., **Shri Kailash Joshi**.

Shri M. Natarajan, Adviser to Gover nor of M.P.

Shri P.K. Baijal, Secretary, Dept. of Industries, Govt. of M.P.

Shri A.C. Wadhawan, Chairman-cum-Managing Director, Hindustan Zinc Ltd., Udaipur.

Shri K. Shivaji, General Manager, National Mineral Development Corpn., Hyderabad.

Shri Ravi Jhunjhunwala, Managing Director, M/s HEG Ltd., Mandideep.

Shri Awadh Giri, President, M/s HEG Ltd., Mandideep

Shri G. Hoynant, Director, M/s HEG Ltd., Mandideep

Shri B.P. Singh, Technical Advisor, HEG, New Delhi.

Shri Jaspal Singh, Technical Manager, Indian Oil Corporation New Delhi

Shri Rakesh Sharma, Pro
M/s Bhilwara Group Ind
Delhi.

Shri S.K. Mandelia, Gra
Nagd

Dr.P.K. Chinnathambi, M
Schmidt-Strasse, Germa

Shri C.S. Hanji, DGM(P),
ment, Birlapur, Narsing

Shri S.S. Yadav, Execu
ITENG Engineering Pvt

Prof. G.S. Marwah, C
former Director of Ind
Mines, Dhanbad.

Prof. S.K. Kawatra, Dep
gical Engg., Michigan
University, USA und
programme.

Prof. P.M. Prasad, Dept
BHU Varanasi.

Shri P.L. Nene, Ch
Jabalpur.

Dr. T.P. Ojha, Dy.DG, ICAR, New Delhi.

Shri G.M. Rao, Director, I.B.M., Nagpur.

Dr. R. Chaudhari, General Manager, Rajasthan State Mines & Minerals Ltd., Udaipur.

Dr. V.V. Subba Rao, Joint Adviser, DSIR, New Delhi

Dr. J.G. Negi, Director General, M.P. Council of Science & Technology, Bhopal

Shri Sharma, Advisor (Beneficiation), Technical Planning & Policy Committee, Ministry of Mines, New Delhi

Shri Hoshiyar Singh, Secretary, Govt. of M.P.

Shri Singh, Collector, Betul

Shri Suresh Chand, Adviser mines, Hindalco Industries Limited, Bombay

Dr. H.R. Bhojwani, Adviser, TUD, CSIR, New Delhi and Project Officers of Polytechnology Transfer Centres of CSIR.

Shri Swamy Karananda, Ram Krishna Mission Ashram, Bastar.

A team of scientists from Karpenco Physico Mechanical Institute of Ukrainian Academy of Sciences, Ukrain consisting of **Prof. Panayuk, Leader of delegation, Prof. Andreykiv and Dr. Kuznyak, members.**

RESEARCH PAPERS AUTHORED BY RRL SCIEN

1. **N. Suresh, M. Vanangamudi and T.C. Rao** "Mathemati sentation of Performance of Coal Cleaning Units", In Engineers (India) Journal - MN, 72, 1991.

2 **C.B. Raju**, "Crystallisation of Glass Fibres obtained from J. Mat. Sci. Lett. 11(9), 1992, pp 547-549.

3 **B.Kujur, Manoj Ban, Jayanta and Navin Chandra** Method for Estimation of Calcium in Minerals by Wet Analysis", Silicates Industriels, 5(6), 1992, pp 68-70.

4. **O.P. Modi Mohini Saxena B.K. Prasad, A.H. Yegneswara Vaidya,** "Corrosion Behaviour of Squeeze-cast Alumi silicon Carbide Composites", J. of Materials Science, 2 3897-3902.

5. **T.C. Rao, L. Sanjeeva Rao and G.M. Rao,** "Beneficiation Low Grade Phosphate Deposits - Problems and Prospe Indian Inst. Met., 3, 1992, pp 195-205.

6. **A.K. Gupta, B.K. Saxena, S.N. Tiwari and S.L. Malh** Formation in Cast Metal and Alloys", J. of Material S 1992, pp 853-862.

7 **B.R. Rao, L.S. Rao, A.K. Mazumdar and T.C. Rao** "Fluo Potassium Extraction from Glauconitic Sandstone for izer", Mineral Engineering, 6(4), 1993.

8 **S.S Amritphale, Navin Chandra and Rajendra Kumar** "Sintering Behaviour of Pyroprylite Mineral: Effect of some Alkali and Alkaline Extra Metal Carbonates", J. of Material Science, 22, 1992, pp 4797-4804.

9 **R. Dasgupta, A. Roy and S.K. Bose** "Debye Characteristic Temperature for Rapidly Solidified Al-Mn Alloys with a Software Package" (1993) Indian Journal of Pure & Applied Physics.

10 **B.K. Prasad,** "Microstructual Modifications and improvement in properties of a Hypo-eutectic Aluminium-silicon Alloy Dispersed with Graphite particulates", J. Mat.Sci.Letter, 10, 1992, pp 867-869.

11. **B.K. Prasad, S.V. Prasad and T.K. Dan,** " Evaluation of some Engineering Properties of an Enamel Coated steel", plating and Surface Finishing, 79 (4), 1992, pp 57-61.

12. **Mohini Saxena, B.K. Prasad and T.K. Dan,** "Evaluation of some Enginering Properties of an Enamel Coated Steel", Plating and Surface Finishing, 79 (4), 1992, pp 57-61.

13. **Mohini Saxena, B.K. Prasad and T.K. Dan,** "Corrosion Behaviour of 2014 - Graphite Composite in Various Environments', J. Mat. Sci., 27, 1992, pp 4805-4812.

14. **O.P. Modi, B.K. Prasad, S.V. Prasad, and A.A. Das,** "Mechanisams of Material Removal and Subsurface Workhardening During Low stress Abrasion of a Squeeze Cast Aluminium Alloy-alumina Fibre composites', Mat. Sci. and Engg., A156, 1992, pp 235-245.

15. **B.K. Prasad, S.V. Prasad amd A.A. Das,** "Mechanisms of Material Removal and Subsurface Workhardening During Low Stress Abrasion of a Squeeze. Cast Aluminium Alloy-alumina Fibre Composites", Mat.Sci. and Engg.., Al 156, 1992, pp 205-209.

16. **L.C. Mohan**, "A New Material for Grinding Balls", IIF, Transactio 1992, p 141-144.

17. **B.K. Prasad, T.K. Dan and P.K. Rohatgi**, "Characterization a Structure - Property Relations in a Pressure Die Cast Hypoeutec Aluminium - Silicon Alloy Dispersed with Graphite Particles Metllkunde, 83, 1992, 871-785.

18. **B.K. Prasad**, "Structure-property Relations in a Hypereutectic A minium-silicon Alloy Dispersed with Graphite Particles", J. of Mat.S 28, 1993, 100-104.

19. **S. Das and B.K. Prasad**, "Tribological Behaviour of Aluminium A Composites : A Comparative Study with a Copper Base Allo Proceedings of International Conference on Wear of Mate (WOM-93), Wear, 162-164, 1993, 64-74.

20. **S. Das, B.K. Prasad, A.K. Jha, O.P. Modi and A.H. Yegneswa** "Three-body Abrasive Wear Behaviour of Steel, Ibid, Wear, 162- 1993, 802-810.

21. **Mohini Saxena, A.K. Jha and G.S. Upadhyaya**, "Corrosion Beha of Sintered 6061 Aluminium Alloy-graphite Particle Compos Journal of Material Sciences (in press).

22. **O.P. Modi, A.K. Singh, A.H. Yegneswaran and P.K. Rohatgi**, " Temperature Strength of an Aluminium Alloy Dispersed with Gra ite Particles", J. of Mat.Sci.Letters, 1992, pp 1466-1468.

23. **T.C. Rao, L.S. Rao and G.M. Rao**, "Beneficiation of Indian Low G Phosphate Deposits-Problems and Prospects", Trans. of IIM, 4 1992, pp 195-205.

24. **L.S. Rao and P. Bandopadhyay**, "Applicability of Mozley Mineral Separator for the Treatment of Coal Washery Rejects", Int.J.Miner.Process., 36(1&2), 1992. pp 137-150.

25. **B.R. Rao, L.S. Rao, A.K. Mazumdar and T.C. Rao,** "Fluoride Aided Leaching of Glauconitic Sandstone for a Fluid Fertilizer", Minerals Engineering, 6(4), 1993, pp 405-413.

26. **T. Sharma and T.C. Rao,** "Acid Leaching of Glauconitic Sandstone", Trans. of IIM (Sec.C), 101, 1992, C 165-170.

27. **A.K. Mazumdar, T. Sharma and T.C. Rao,** "Extraction of Potassium from Glauconitic Sandstone by the Roast-Leach Route", Int. J. Miner. Process, 38, 1993, pp 111-123.

APPENDIX-5

PAPERS PRESENTED BY SCIENTISTS OF RRL, BHOPAL

1. **R.N. Yadava, P.D. Ekbote, M.V.R.L. Murthy, Arati Roy, Sulbha Amlathe and B. Tirupati** "Water Quality of Shallow Groundwater in Parts of Tawa Canal Command Area" at Water Resources Day celebrations, Institution of Engineers (India), Bhopal.

2. **M. Prasad, L.S. Rao, A.K. Majumdar, P. Banerjee, G.M. Rao, and T.C. Rao** "Low Grade Rock Phosphate Deposit of Madhya Pradesh - A Possible Resources for Fertilizer Industry" in National Seminar on Research and Process Development in Mineral Preparation, at NML, Jamshedpur.

3. **J.P. Barnwal, B. Govindarajan, M. Vanangamudi and T.C. Rao** "Model Studies on Flotation of Indian Coal Fines", Ibid.

4. **S.P. Narayan, V. Rao and O.N. Mohanty,** "Low Carbon Structural Steels for Soft Magnetic Applications - An Appraisal" INDO-US Pacific RIM Workshop on Advances in Low Carbon High Strength Ferrous Alloys, March 25-28, 1992, New Delhi.

5. **T.C. Rao,** keynote address on "Fundamentals of Gravity Concentration", Nat. Seminar on Gravity Concentration and Indian Mineral Industry, 26-27 Feb. 1992, Bhubaneswar, pp 43-50.

6. **P. Bandopadhyay and L.S. Rao,** "Fine Coal Beneficiation by Gravity Concentration Methods", Nat. Seminar on Gravity Concentration and Indian Mineral Industry, 26-27 Feb. 1992, Bhubaneswar, pp 184-197.

7. **Mohini Saxena, O.P. Modi, B.K. Prasad and A.H. Yegneswaran** "Role of the Alloy Matrix and the Nature of Dispersoid on the Corrosion Characteristics of Aluminium Alloy Composites", International Conference and Exhibition on Advanced in Materials and Processes, ASM International Indian Chapter, Bombay, Feb. 1992.

8. **O.P. Modi, Mohini Saxena, B.K. Prasad and A.K. Jha** "Erosion Corrosion Characteristics of an Aluminium Alloy Dispersoid with Al2O3 Fibres", ibid.

9. **Mohini Saxena and A.C. Khazanchi** "Property Characteristic of Polymer Matrix Reinforced with Red Mud Particles and Sisal Fibre", International Conf. on Polymer Processing, Polymer Processing Eight Annual Meeting, New Delhi, March 1992.

10. **A.C. Khazanchi, Mohini Saxena and A.N. Meshram** "Natural Fibre Reinforced Polymer Composites as a Replacement of Wood in Housing", International Conference and Exhibition on Advanced in Materials and Processes, ASM International, Indian Chapter, Bombay, Feb. 1992.

11. **Mohini Saxena, R.K. Morchhale, A.N. Meshram and A.C. Khazanchi** "Development of Sisal Cement Composites as a Substitute of Asbestos Cement Components for Roofing", Accepted in Nov.91 for presentation in RILEM Symposium, University of Sheffield, U.K., July, 1992.

12. **M. Saxena, A.C. Khazanchi and Alka Meshram** "Material Science of Textile Fibre (Sisal) Cement Composites for Housing", Accepted in Nov.91 for presentation in 2nd Int. Nat. Symp., Textile Composites in Building Construction, 23-25 June, Lyon, France, 1992.

13. **A.C. Khazanchi, Mohini Saxena, Alka Meshram and A.H. Yegneswaran** "Textile Fibre Reinforced Polymer Composites as a Replacement of Wood in Housing", Accepted in Oct.91 for presentation in 2nd Int. Nat. Symp., Textile Composites in Building Construction, 23-25 June, 1992 Lyon, France.

14. **B.K. Prasad, A.K. Jha, S. Das, O.P. Modi and A.H. Yegneswaran,** "Synthesis and Characterization of Zinc-Aluminium Alloy-hard Particle Composites", 30th NMD & 46TH ATM of IIM, Udaipur, Nov 14-17, 1992.

15. **O.P. Modi, A.K. Jha, B.K. Prasad, S. Das, A.H.Yegneswaran and Y.R. Mahajan,** "Cast Aluminium Alloy-silicon Carbide Particle Composites : Syntheses and Property Characterisation", ibid.

16. **Rupa Dasgupta and S.K. Bose** (1992), "Debye Characteristic Temperature & Structural Stability of Rapidly Solidified Al-base Alloys", ibid.

17. **P. Bandopadhyay and L.S. Rao,** "Fine Coal Beneficiation by Gravity Concentration Methods", Nat. Seminar on Gravity Concentration and Indian Mineral Industry, Bhubaneswar, pp 184-197, Feb.'92.

18. **M. Prasad, L.S. Rao, A.K. Mazumdar, P. Banerjee and T.C. Rao,** "Low Grade Rock Phosphate Deposit of M.P.- A Possible Resource for Fertilizer Industry", Nat. Seminar on Research and Process Development in Minerals Preparation, NML, Jamshedpur, April'92.

19. **L.S. Rao, D.V. Pitchamuthu and T.C. Rao,** "Beneficiation of Almora Magnesite using Multi Gravity Separator", Int. Sem. on Mineral Sector in India : Need and Scope of Development under new Economic policy of Globalisation and Tech. Upgradation, Hyderabad, 11-15, Feb.'93.

20. **B.R. Rao and L.S. Rao,** "N-Alkyl Amino Acid- An Useful Reagent for Apatite Flotation", National Seminar on Application of Chemical Engineering in the Utilisation of Natural Resources, RRL, Bhubaneswar, 24-25 Feb.'93, 70-74.

21. **D.P. Patil and J.R.G. Andrews,** "Lumped Population Balance Model for Floc Breakage", National Seminar on Application of Chemical Engineering in the Utilization of Natural Resources, Bhubaneswar, 24-25 Feb. 93.

APPENDIX-6

LECTURES

Invited Lectures by outside experts

Dr. G.T. Marathe, Centre for Studies in Resources Engg., IIT, Bombay "Run off estimation through hydrological information system"

Dr. Y.R. Mahajan, Defence Metallurgical Research Laboratory, Hyderabad "Metal Matrix Composites".

Prof. H.S. Ray, Director, RRL, Bhubaneswar "New Processes for Iron making".

Dr. Ashish Kumar Gondal "Lubrication in IC Engines"

Prof. S.K. Kawatra, Dept. of Metallurgical Engg., Michigan Technological University, USA on "Removal of pyrite in coal flotation."

Dr. T. Balakrishna Bhat, Deputy Director, DMRL Hyderabad, "Science of Armour Material"

Dr. K.A. Natarajan, Professor, Deptt. of Metallurgy, I.I.S.C. Bangalore, "Biomineral Technology"

Dr. R.K. Ray,Professor, Dept of Met.Engg. IIT, Kanpur,"Texture in metals & alloys, Applications of texture in industry".

Dr. P.A. Krishna Murthy, Scientist, Electrical Research & Development Association,Vadodara,"Testing of Insulation Materials".

Dr. P.K. De, Scientist, BARC, Bombay,"Stress corrosion cracking of metals".

Prof. H.S. Ray, Director, RRL, Bhubaheswar, "Sailing Against Wind in Science and Technology".

Shri B.N. Dey, Scientist, RRL, Bhubaneswar, "Nickel Extraction Technology".

Dr. H.R. Bhojwani, Adviser, TUD, CSIR, New Delhi, "CSIR New Challenges in Marketing Technology"

Invited Lectures by RRL Staff

Prof. T.C. Rao "Story of Coal" Central Power Research Institute, Bhopal.

Dr. R.N. Yadava "Overview on Environment and roll of R&D Organisation" in the workshop on "Environment Protection and Pollution control" organised by M.P. Pollution Control Board, Bhopal.

Dr. A.H. Yegneswaran "Tribology, Composites and R&D Activities at RRL Bhopal" BHEL, Tiruchirapalli.

Dr. A.H.Yegneswaran "Effect of inclusion content on the mechanical properties and deep drawability of Al alloy" BALCO .

Dr.(Miss) Mohini Saxena "Development of sisal cement roofing sheets as an alternate of AC sheets" Building Res. Establishment, Watford, U.K.

Dr.(Miss) Mohini Saxena "Development of red mud polymer composite" Watford, U.K.

Dr. S. Das "Tensile properties of Aluminium alloys at elevated temperature" BALCO

L. Sanjeeva Rao "Modelling of leaching of glauconite sandstone using reduced time plot concept" at Institute of inorganic chemistry and metallurgy of rare elements, Technical University of Wroclaw, Poland

L. Sanjeeva Rao "Mozley mineral separator - its application for treatment of coal washery rejects" at Institute of mineral processing and waste utilisation, University of Mining and Metallurgy, Poland

Internal Seminars

S.P. Narayan, "High Performance Magnets Nb-Fe-B Magnets"

Dr. S. Das, "Deep Drawability of Al alloy"

B. Tirupati, "Groundwater Resources Management in Tawa Canal Command Area"

Dr. M.V.R.L. Murthy, "Development of Groundwater Surfaces Through Modelling"

Dr. A.K. Gupta, "Sulphur in steel"

APPENDIX-7

MEMBERSHIPS AND RECOGNITIONS

rof. T.C. Rao

* Vice Chairman, Scientific Advisory Committee, Mineral Resources Dept. M.P.

* Ex-officio member of board of Directors, Housing Development Institute, Bhopal.

* Assessor of the paper in Institute Transactions, Mining, Geological & Metallurgical Inst. of India, Calcutta.

* Chairman, Advisory Council Regional Science Centre Bhopal of National Council of Science Museum.

* Given a certificate of Best Paper Award on his paper Grinding Aids for Energy Conservation : A Case Study On Grindability of Iron Ore, Indian Chemical Engineering Congress'1991.

* Nominated as Assessor of the papers in Mineral Beneficiation/coal Utilisation for publication in the Institute's Transactions for the years 1991-92 & 1992-93 by the Mining, Geological & Metallurgical Institute of India, Calcutta.

* Elected as Council Member of the 45th Annual General Meeting of the Indian Institute of Metals, Calcutta.

* Nominated as the CSIR nominee on the MPCOST.

* Member of RSOP - Thermal working group on lift estimation and Refurbishing of thermal power station CBIP, New Delhi along with Dr. A. H. Yegneswaran.

* Elected as President, Indian Institute of Mineral Engineers.

* Fellow, Indian National Academy of Engineers.

* Nominated as Member Editorial Advisory Board of Transaction of IIM.

* Awarded certificate of merit for the paper "Mathematical representation of performance of coal cleaning units" by the Institution of Engineers (India) .

Dr. Kunal Basu

* Member M.C., NEERI, Nagpur.

S.K. Bose

* Elected Secretary, Indian Institute of Metals, Bhopal Chapter.

Dr. R.N. Yadava

* Nominated peer on panel for Mathematical Modelling for S&T Studies, NISTADS, New Delhi.

* Supervisor for Ph.D Degree of Barkatullah University, Bhopal in Mathematics, Civil Engg. and Applied Mathematics.

* Supervisor and Visiting Professor in the Deptt. of Future studies for planning of DAVV Indore.

Dr. A.H. Yegneswaran

* Member of Official Language Committee, RRL Bhopal.

* Elected Treasurer, Indian Institute of Metals, Bhopal Chapter.

.P. Narayan

* Elected Central Executive Committee Member of Institute of Standards Engineers, New Delhi.

)r. A.K. Gupta

* Appointed as Referee for the Indian Journal of Agricultural Engineering by the Editorial Board of Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, New Delhi.

)r. (Ms) Mohini Saxena

* Elected National Secretary for India of International Society of Electrochemistry (associated organisation of IVPAC) Switzerland.

* Editorial Advisory Board, Int. J.of Physical Sciences.

..C. Mohan

* Hon. Secretary, Inst. of Indian Foundrymen, Bhopal Chapter.

)r. S. Das

* Elected Joint Secretary, Indian Institute of Metals, Bhopal Chapter.

* Jt. Hon. Secretary of IIM Bhopal Chapter.

)r. (Mrs.) Arati Roy

* Supervisor for Ph.D Degree of Barkatullah University, Bhopal in Applied Mathematics.

Higher Education

* **B. Govindarajan,** Scientist - awarded Doctor of Philosophy by Indian School of Mines, Dhanbad.

* **Ms. Rupa Dasgupta**, Scientist - awarded the M.S. degree in S&T from BITS, Pilani.

* **V.S. Muneshwar**, Scientist - awarded the M.S. degree in S&T from BITS, Pilani.

* **S.A.R. Hashmi**, Scientist - awarded the M.S. degree in S&T from BITS, Pilani.

* **S.R. Karade,** JTA - awarded AMIE in Civil Engg.

* **K. Venkateswarlu:** Awarded the Degree in Metallurgical Engineering, IIM Calcutta.

* **Mithilesh Kumar** : Awarded the Ph.D. degree in Metallurgical Engineering, Banaras Hindu University, Varanasi.

APPENDIX - 8

SEMINARS/WORKSHOPS/CONFERENCES ATTENDED BY RRL STAFF

* **Prof. T.C. Rao, Dr. K. Basu, Dr. R.N. Yadava, Shri A.C. Khazanchi and Mr. B. Prabhakar**, "One day Seminar on Technology Awareness Programme at SISI Indore"

* **Prof. T.C. Rao,** "CSIR Golden Jubilee International Conference of Heads of Scientific Agencies" New Delhi

* **Dr. Kunal Basu, Sri S.K. Bose, Dr. R.N. Yadava, Dr. C.B. Raju, Sri. P.D. Ekbote** attended Interaction meeting on absorption of imported technology, organised by DSIR & CII, Bhopal, 2.11.92.

* **Dr. R.N. Yadava, Mr. P.D Ekbote** attended workshop on "Environment Protection and Pollution control" organised by M.P. Pollution Control Board, Bhopal, 2.12.92.

* **Mr. S.K. Bose, Dr. A.K. Jha, Mr. S.P. Narayan, Mr. B.K. Prasad, Ms. Rupa Dasgupta** attended "30th National Metallurgists Day (NMD) and 46th Annual Technical meeting (ATM) & the International Symposium on Recent Advances in extraction technology: Non ferrous metals", Indian Institute of Metal, Udaipur, Nov. 14-17, 1992.

* **Mr. S.K. Bose,** delivered invited talk on `SEM a tool for materials characterization and analysis' in the International conference on maintenance, inspection, corrosion, managements & plant reliability- organised by IIM & IPCL BARODA. The talk was delivered at IPCL BARODA, auditorium on 30.1.1993. In the honour a memento was presented by the Chairman to Mr. S.K. Bose.

* **Mr. B. Tirupati**, attended a training programme on `Water Quality Modelling' organised by CMMACS, Bangalore and NEERI, Nagpur held at CMMACS, Bangalore 25th to 30th Jan' 1993.

Prof. T.C. Rao and Mr. L. Sanjeeva Rao attended "International Seminar on Mineral Sector in India: Need and Scope of Development Under new Economic Policy of Globalisation and Technology Upgradation", Hyderabad, 11 to 13th Feb'1993.

Mr. P.D. Ekbote attended a course on "Management of R&D Systems" at ASCI, Hyderabad, Feb.22-26, 1993.

APPENDIX - 9

STAFF NEWS

Appointments

Dr. D.P. Patil, Scientist-C

A.P. Asokan, Scientist-B

D. Mondal, Scientist-B

Shrimanth, Scientist-B

R.S. Ahirwar, Scientist-B

K. Udaya Bhaskar, Scientist-B

Dr. Mithilesh Kumar, Fellow

S.R. Karade, Jr. Technical Asstt.

P.K. Rangari, Jr. Technical Asstt.

K. Khosala Rao, Jr. Technical Asstt.

S.K. Suryavanshi, Electrician

M. Vinaya Raju, Jr. Stenographer

Ms. Visakha Ramteke, Jr. Stenographer

Ms. Anita Daniel, Receptionist

Vinod D. Dahate, SO

Mukesh Khanna, Dy. S.P.O.

Assessments

S.K. Bose	Gr.IV(4)	to	Gr.IV(5)
K.K.S. Gautam	Gr.IV(2)	to	Gr.IV(3)
P.D. Ekbote	Gr.IV(2)	to	Gr.IV(3)
Dr.(Miss) Mohini Saxena	Gr.IV(1)	to	Gr.IV(2)
Dr. A.K. Gupta	Gr.IV(1)	to	Gr.IV(2)
B.K. Prasad	Gr.IV(1)	to	Gr.IV(2)
B. Kujur	Gr.III(2)	to	Gr.III(3)

Retirements

B.D. Jha, F&AO on Superannuation

A.C. Khazanchi, Scientist F on Superannuation

Transfers

G. Simhachalam, COA (on transfer from CECRI, Karaikudi)

C.S. Shanmughom, COA (transferred to CECRI, Karaikudi)

V.G.S. Rao, Dy. SPO (transferred to NGRI, Hyderabad)

Resignation

S. Pali, Cataloguer