PN-ABK-931
76594

ANNUAL PROGRESS REPORT

on

"A Unit For Repair, Maintenance & Innovation

of

Scientific Equipment, 8.020 "

Project No. 936-5542.03

Agency for International Development
Library
Room 105 SA-18
Washington, D.C. 20523

Submitted To

USAID

Program In Science & Technology Cooperation

(PSTC)

by

Royal Nepal Academy of Science & Technology

(RONAST)

August 7, 1989

Kathmandu, Nepal

Project Personnel:

Project Chief : Dr. Surendra R.S. Kafle
Associate Member

Technical Officers:

1. Dr. Yudha B. Chettry
   Senior Technical Officer
   (Mech. Engineer)

2. Mr. Nara R. Giri
   Asst. Technical Officer
   (M.Sc. Physics)

3. Mr. Suresh Man Singh
   Asst. Electronics Engineer
   (B.E.)

Project Starting Date: August 7, 1988

Duration: Two Years (Phase I of this Programme)

Total Amount: U.S. $ 1,50,000.00

Overall Aim & Objectives Of The Programme

The overall aim of this Scientific Instrumentation Project is to provide extra momentum in the scientific R&D work as well as to help & facilitate in the qualitative improvement of science teaching. The objectives of this project are:

1. To take stock of the various types of equipment that are available in the country and maintain a list which require frequent repair and maintenance.

2. To train or help to train suitable technicians by inhouse training for the repair and maintenance of equipment mentioned above.

3. To study the requirements of schools and colleges in the area of teaching and laboratory equipment and develop low cost locally produced (LCLP) equipment which will meet these requirements.

4. To organize training programmes/workshops/seminars etc. for teachers to use these equipment for educational purpose and to use the feedback thus obtained for the innovation of new equipment.

5. To produce or help to produce LCLP equipment on large scale and get them supplied to users on no loss no profit basis.

6. To increase the S&T capability of the country by creating an essential infrastructure.

Progress According To The Technical Work Plan

This project is not research oriented but its nature is of infrastructure development type. Its main functions are:

1. Development of manpower and physical facility.
2. Designing and fabrication of new equipment.
3. Repair and Maintenance service.
4. Instrumentation culture development

Hence it is obvious that the work plan is not only technical one but it would also contain management and service component. Broadly it is envisaged in two phases. The main componets of the first phase and progress are as follows:

- A report on updating of the existing inventory of instruments and equipment, their current status, utilization and type of repair and maintenance services needed in different institutions are being done and other data collection work is going on.

- For the establishment of design, electronics and mechanical sections, the construction work for the workshop is going on in Khumaltar where the RONAST Complex is located. About fifty percent work has been completed.

- Repair and Maintenace services to different S&T organizations and institutions according to the demand has been done. Most of the equipment were of the following types:

    1. Oscilloscope
    2. Timer/Scaler
    3. Function Generator
    4. Power Supply System
    5. pH Meter
    6. Centrifuge Machine
    7. Electronic Balance
    8. Vacuum Pump
    9. Voltage Stabilizer
    10. Multimeter
    11. Other Educational Kits

- Project Chief Dr. S.R. Kafle visited Regional Instrumentation Centre(RIC) of Indian Institute of Science(IISc), Banglore in January 1989. Research Department Chief Professor J.S. Jha and Dr. S.R. Kafle further visited certain centres of Thailand and Singapore from May 7-17, 1989. Detail report of visit is attached herewith. By this visit it will help to strengthen relation between this Instrumentation Unit with other well equipped foreign Instrumentation Centres.

- Similarly one of the scientists from Centre RIC Bangalore had visited our Instrumentation Unit in March 1989. He was the resource person for inhouse-training of our existing technical staff. Short term training of technicians are being arranged in RIC, Banglore in the near future.

- Spare parts and small components needed for repair and maintenance works were procured from our local market and those which were not available locally were brought from India.

- For the development of more LCLP science equipment for school level, a four-day workshop on low cost science teaching equipment for secondary science teacher was organized from 26-29 March, 1989 at the Instrumentation Unit. It was jointly organized with Science Education Development Centre (SEDEC). Thirty three secondary level science teachers had participated in this workshop. Four types of low cost equipment were prepared by the participants and were given as a gift for their school's use.

- Design and development of LCLP equipment at the Instrumentation Unit and their demonstration to their concerning teachers are going on. According to the programme twelve equipment had to be developed in the first year. But due to the unavoidable present situation of the economic crisis (fuel and construction materials) many works could not take place in time. As a result the fund alloted for the first year was not spent as planned. Now the efforts are underway to minimize the effect of these problems. Now we have rescheduled the whole remaining budget. The following equipment have been developed during this period:

1. Demonstraion of Bouyancy force
2. Parallel resistors divide the current
3. Maximum power transfer theorem
4. Action of Bridge Rectifier
5. Charging and discharging of capacitors
6. Behaviour of resistor

Despite the unexpected crisis, the project is on the progress according to its initially set up schedule to bring forth some meaningful result by all means. The estimated time schedule for Phase-I and time reschedule of the project are shown in Table No. 1 and 1.1.

- A "National Workshop on Educational and Scientific equipment" for college level physics teachers is going to be organized from August 17-21, 1989. The International Centre For Theoritical Physics (ICTP), Italy is co-sponsoring this workshop. Nearly thirty physics teachers from different science campuses from all over the country are participating in this workshop. Eight resource persons from different countries of this region are invited to give lectures on basic electronics, digital systems, analog systems and also to discuss the problems associated with repair and maintenance of scientific equipment. The invited resource persons are from India, Sri Lanka, Pakistan, Thailand, Bangladesh and Nepal. The brochure of this workshop is attached at the end of this report.

For the establishment of the design and the electronics sections, the necessary few equipment have been ordered for procurement. The procurement of major equipment for this activity has been rescheduled. These equipment would be procured in accordance with the new programme. The equipment which were ordered already are expected to arrive in a month or so. The list of the ordered equipment are as follows:

1. Tachometer, 5-20,00 r.p.m.
2. Digital Multimeter
3. Decade Resistance Box
4. Decade Capacitance Box
5. Portable Luxmeter
6. Variable Power Supply
7. Function Generator
8. Oscilloscope
9. Frequency Meter
10. Logic Circuit Training Kit
11. Microprocessor Training Kit

Table 1

Estimated Time Schedule for Phase -1 of the Project

S.No.	Main Activities
1.	Updating of the Existing Inventory of Instruments their current status, services needed.
2.	Procurement of machines, equipments, components needed for various section and their installation.
3.	Obtaining the services of Foreign Experts and technicians for at least six man months each year and training of unit staff.
4.	Visit of Project Chief and Technical Officers in other such centres abroad (Singapore, Thailand or Kenya).
5.	Short term training of Technical Staff in India, Singapore or other countries in Instrumentation, Electronics, Refrigeration, Opticals etc.
6.	Repair & Maintenance Services to other organisations: a) For simple equipment b) For sophisticated equipment
7.	Organisation of Training Workshop for the teachers at least 2 each year.
8.	Development of LCLP equipment at least 12 each year and efforts to get them produced on largescale.
9.	Development of institutional linkages with School & College Teachers of Kath. Valley by the regular visits of Technical Staff and to know their problems.
10.	To develop new college level LCLP equipment with the help of foreign experts and study about their usefulness and distribution to Scientific Educational Institutions.
11.	Evalution of Phase-1 programme and preparation of Phase -11 Project.

Table 1.1

Estimated Time Rescheduled for Phase- 1 of the Project

S.No.	Main Activities
1.	Updating of the Existing Inventory of Instruments their current status, services needed.
2.	Procurement of machines, equipments, components needed for various section and their installation.
3.	Obtaining the services of Foreign Experts and technicians for at least six man months each year and training of unit staff.
4.	Visit of Project Chief and Technical Officers in other such centres abroad (Singapore, Thailand or Kenya).
5.	Short term training of Technical Staff in India, Singapore or other countries in Instrumentation, Electronics, Refrigeration, Opticals etc.
6.	Repair & Maintenance Services to other organisations:
	a) For simple equipment
	b) For sophisticated equipment
7.	Organisation of Training Workshop for the teachers at least 2 each year.
8.	Development of LCLP equipment at least 12 each year and efforts to get them produced on largescale.
9.	Development of institutional linkages with School & College Teachers of Kath. Valley by the regular visits of Technical Staff and to know their problems.
10.	To develop new college level LCLP equipment with the help of foreign experts and study about their usefulness and distribution to Scientific Educational Institutions.
11.	Evalution of Phase-1 programme and preparation of Phase -11 Project.

TABLE NO.: 2
STATEMENT OF EXPENDITURES
OF THE FIRST YEAR
GRANT AGREEMENT DATED AUGUST 7, 1988
SCIENTIFIC INSTRUMENTATION UNIT: A UNIT FOR REPAIR AND MAINTENANCE AND INNOVATION OF SCIENTIFIC EQUIPMENT, NO.: 8.020

Budget Activity	Total Budget for the Life of the Project U.S. $	Total Budget NFY 2045/46 N. Rs.	Funds Received NFY 2045/46 N. Rs.	Cumulative Gross Expend NFY 2045/46 N. Rs.
1.Salary	41,000	4,50,000	1,50,000	4,50,000.00
2.Training	10,000	1,32,000	70,000	56,716.80
3.Equipment	51,500	7,00,000	5,00,000	4,91,801.24
4.Materials & Supplies	15,000	2,20,000	1,80,000	77,883.64
5.Travel	7,000	1,10,000	70,000	63,060.00
6.Other Direct Cost	23,500	2,97,000	1,20,000	84,930.00
7.Indirect Cost	2,000	22,000	7,000	6,500.62
Total	1,50,000	19,31,000	10,97,000	12,30,856.30

TABLE NO :3

PROJECT NO. 939-5542.03

GRANT AGREEMENT DATED AUG. 7, 1989

STATEMENT FOR THE RELEASE OF BUDGET FOR II-YEAR

SCIENTIFIC INSTRUMENTATION UNIT: A UNIT FOR REPAIR, MAINTENANCE AND INNOVATION OF SCIENTIFIC EQUIPMENT.

BUDGET	TOTAL AMOUNT FOR TWO YEARS	BUDGET FOR II YR	BALANCE FROM I YEAR	TOTAL BUDGET FOR II YEAR NFY-2040/47		I-TRI MESTER	II-TRI MESTER	III-TRI MESTER	REMARKS
	US$	US$	US$	US$	N RS	N RS	N RS	N RS	
1- SALARY	41,000	20,500	----	20,500	6,15,000	2,05,000	2,05,000	2,05,000	
2- TRAINING	10,000	4,000	3,000	7,000	210,000	1,05,000	52,500	52,500	
3- EQUIPMENT	51,500	21,500	14,000	35,500	10,65,000	10,65,000	----	----	
4- MATRS. & SUPP.	15,000	5,000	3,000	8,000	2,40,000	1,20,000	60,000	60,000	
5- TRAVEL	7,000	1,000	2,000	3,000	90,000	45,000	22,500	22,500	
6- OTHER DIR. COST	23,500	10,000	9,000	19,000	5,70,000	2,85,000	1,43,000	1,42,000	
7- INDIRECT COST	2,000	1,000	548	1,548	46,440	23,340	11,490	11,610	
TOTAL	1,50,000	63,000	31,548	94,548	28,36,440	18,48,340	4,94,490	4,93,610	

Prepared by :
Accountant, RONAST
New Baneshwor

Certified by :
Dr. Surendra R., Kafle
Associate Member, RONAST
New Baneshwor

Approved by :
J. S. Jha
Member, RONAST
New Baneshwor

REPORT OF INSTRUMENTATION CENTRES' VISIT

1. Scientific & Technological Equipment Centre (STREC), Chulalongkorn University, Thailand

STREC is considered to be the premier instrumentation centre in Thailand. It is composed of two service divisions and a secretarial section.

Research-Supporting Division

It is equipped with tools and equipment necessary for development of research equipment which cannot be readily purchased, but must specially constructed for particular research projects. It is further divided into:

- Machine Shop:- Equipped with universal milling machine, tool room lathes, shaper, surface grinder and radial drill gas and electric welders, sheet metal forming equipment.
- Glass Blowing Shop:- Set, lathe, annealing oven, cutter and drill.
- Electronic Shop:- High frequency oscilloscope, storage oscilloscope, frequency counter, signal generators, electrostatic voltmeters, digital voltmeter, logic analyser.
- Physical Testing and Microstructural Analysis:- Universal testing machine, high temperature vaccum furnace, hardness tester, surface roughness tester, metallurgical microscope and other analysis supporting instruments.

Instrumental Analysis Division

This division consists of laboratories equipped with necessary equipment for the determination of the composition of elements in various compounds and the study of the molecular structures of the compounds extracted from minerals, plants and herbs. It has various types of sophisticated analytical instruments like SEM, GC mass, x-ray fluorescence, UV-VIS, emission spectrometer, DTA, plasma reactor, GLC, HPLC, elemental analyser, etc.

Manpower & Activities

This centre has 7 engineers, 15 scientists and 13 support service staffs. In addition to routine instrumental analysis services to various institutions, STREC also organises training, workshops, seminars at national and regional level. Its services are open for the scholars in and outside the country.

Best Available Document

Possible Cooperation

STREC would gladly analyse samples from our lab with nominal fee and some trainees can be accomodated for short period. Persons contacted were: Dr. Virul Mangclaviraj, Director and Dr. Suvit Punnachaya, Asst. Director.

2. Institute for the Promotion of Teaching Science & Technology (IPST), Bangkok

IPST is an autonomous state-enterprise within the Ministry of Education. It is responsible for the promotion and development of science, mathematics and technology curricula at all school levels in Thailand. It has several teams in different subjects and one team is for "Equipment Design and Production" work. This is responsible for the design and construction of effective and low-cost equipment for school level teaching. We visited this section and found it equipped with small mechanical workshop. It has developed simple equipments some of which are produced by other manufacturing units.

The booklets produced by this team is useful for our instrumentation unit to make such equipments here.

Possible Cooperation

SEDEC of Kathmandu has close cooperation with IPST. RONAST can also develop exchange programme with IPST for the exposure of our staff members to learn low-cost equipment development. Persons contacted were: Deputy Director Dr. Thongchai Chewpreecha and Mr. Phongchai Sripan.

3. Department of Physics, Khon Kaen University, Thailand

This university was established in 1964 and only undergraduate programmes are conducted in the physics department. Comparing with the facilities of our undergraduate physics departments the labs of Khon Kaen University were found to be highly equipped and in certain respects better than our P.G. Department of Physics. A small group of young physics teachers are engaged in their research activities in astrophysics, nuclear physics, electronics, applied physics and solid state physics. This type of initiative is not found among the teachers of our campuses and is worth imitating.

The purpose of visit was to observe their activities in instrument development. Electronic Teaching Aid Modules developed by Mr. R. Thomas with the help of COSTED & UNESCO seemed very useful and are currently used in electronics laboratories. They have also initiated a project to develop FT-NMR and NMR imaging for biological and medical applications. Some work on carbon dioxide laser equipment was also done to facilitate experiments in B.Sc. classes. Some simple superconductor of Y-Ba-Cu-O sample in bulk form was prepared and properties studied.

Best Available Document

Possible Cooperation

Apart from above research activities the team has developed following LCLP equipment which are useful for the Instrumentation Project of RONAST:

- Power Supply
- Logic Trainer
- Regulator
- Digital to Analog and Analog to Digital Converter
- Counter, RAM, Flip Flop, etc.

The department had conducted a workshop on Methods of Teaching Physics (1981) and another on Instrumentation (1988) in which RONAST had also sent a participant.

Persons contacted were: 3 Assistant Deans, Acting Head of Physics Department Dr. Rong Rujkorakarn and other teachers. This contact can be continued by regular communication and inviting some of them in our future workshop.

4. Science Council of Singapore (SCS), Singapore

This organisation was formed in 1967 for giving advice to government on the S&T development of Singapore. In 1986 it was restructured under the Ministry of Trade and Industry and now its primary mission is to promote the growth of the technology-based innovation process in Singapore. It is responsible for managing Singapore Science Park which has developed into a centre of individual R&D and high technology. R&D companies in medical diagnostics, plant genetics, robotics, marine technology and computer hardware/software situated in the Park.

Possible Cooperation

SCS plays an important role in promoting S&T by generating increased awareness of R&D activities in Singapore through conferences, seminars, forums, publicating and also by arranging visits of foreign dignitories to the Park. Our own visit to various centres of Singapore were arranged by them. SCS maintaining relation with International S&T institutions and RONAST would have many chances of future contact with this organisation. Persons contacted were: Dr. Vincent F.S., Yip Executive Director; Mr. Siew Ring Yun, Secretary; and Mr. Yeow Seng Tuck, Research Officer.

5. Innovation Centre, National University of Singapore, Singapore

This small centre under the faculty of engineering has the object of creating an environment to stimulate students interest in engineering innovation and to assist students in developing skills. This centre has an exhibition hall of 200 square metres to display various exhibits of innovative engineering design from undergraduate and post graduate students projects. The centre has various Innovation Awards for creating interest in students to develop equipments and has links with industry.

Some interesting models displayed at the centre are as follows:

- The N-Gram, An-N-Dimensional Graph Paper
- Self-contained Multichannel Automatic Retrieval of Temperature (SMART)
- In-Process Fibre Optic Refractometer
- Universal Industrial Controller
- Microwave Six-Port Network Analyser
- Scanning Electron Microscope Image Collection and Processing System (SEMICAPS)
- Ferrocement Structural Element
- Study of Tidal Motion and Sedimentation
- Three-Dimensional Surface following with a Robot Arm, etc.

All these involved a good knowledge of engineering. Person contacted was Director Mr. Ong Chor Eong.

6. Centre for Industrial Collaboration NUS

This centre is going to be established under the Faculty of Science on the pattern of Innovation Centre of engineering faculty. Work was in progress and it was expected that it would be operational in couple of months. We discussed about its plans with Dr. Manjeet Sing, Director and were told that it would exhibit the innovative research results and models from the faculty of science and would keep close contact with industry.

B

7. **Department of Chemistry NUS**

This department has good facility for teaching and research work in chemistry. Prof. Sim Kong Yeow took us around various labs and discussed about its activities. It has almost all sophisticated analytical equipment and instruments and some of them are plenty in numbers. For their repair & maintenance they pay a good amount yearly to the suppliers.

Prof. Sim assured that they would try to do instrumental analysis in selected cases on request from us.

8. **Singapore Institute of Standards and Industrial Research (SISIR), Singapore**

SISIR is a government agency under the Ministry of Trade and Industry and its mission is to promote and upgrade quality and technology in the manufacturing sector, with the aim of enhancing the international competitiveness of Singapore made products.

It has a staff strength of about 350 out of which 100 are professionals, 180 technical support staffs and rest in administration. It has 6 divisions and main 2 technical divisions are as follows:

- Standards and Quality Assurance Division: Activities of this division includes standardisation, certification, quality systems, export technical assistance, scientific laboratory accredition, metrology, etc.

- Industrial Technology Division: This division is involved in the application of technology for the upgrading of local industry. It undertakes transfer of technology through consultancy, training, industrial R&D, and provision of technical support services. It has various centres, viz.,

  - The Material Technology Centre
  - The Design and Development Centre
  - The Food Technology Centre
  - The Product Evaluation Centre

  These centres are having remarkably good instrument and other facilities for research and analytical work in various technologies like metals, plastics, chemical, surface, mechanical, food and electrochemistry.

  They have good library and patent information system. Users can retrieve up-to-date information through on-line access to overseas, databases and patent information centre.

How To Apply :

Kindly fill in the application form attached to this brochure get it countersigned by the head of the institution or any other authorized person and send it to reach RONAST office before July 17, 1989.

Correspondence :

All the correspondence for further information as well as the application form should be sent to :

Dr. Y.B. Chettry

Technical Officer

Instrumentation Unit

Royal Nepal Academy Of Science & Technology (RONAST)

P.O.Box 3323

New Baneshwor, Kathmandu

Nepal

Telephone: 213060, 212543

Telex/Cable: 2599 NP/RONAST

NATIONAL WORKSHOP

ON

EDUCATIONAL & SCIENTIFIC EQUIPMENT

August 17-21, 1989

at

Royal Nepal Academy Of Science & Technology (RONAST)

New Baneshwor, Kathmandu

Nepal

Sponsored By

International Centre For Theoretical Physics (ICTP)

In cooperation with

United States Agency for International Development (USAID)

Scope Of Workshop:

The workshop is being jointly organised by International Centre For Theoretical Physics(ICTP), Trieste, Italy and Royal Nepal Academy of Science & Technology(RONAST).

This workshop will provide opportunity to persons working/teaching in the institutions/campuses to understand the basic electronics including digital and analog systems and to discuss the problems associated with the repair and maintenance of the scientific equipment being used in institutions/campuses.

The following topics would be covered:

1. Concepts on Basic Electronics
2. Analog Systems
3. Digital Systems
4. Practical Applications of Analog & Digital Systems

Faculty :

The following resource persons have confirmed about their participation in the workshop.

1. Prof. P.C. Jain
   Dept. of Physics and Astrophysics
   University of Delhi
   Delhi, India

2. Dr. M.V. Lele
   Regional Instrumentation Centre
   Indian Institute of Science
   Bangalore, India

3. Dr. P.A.J. Ratnasiri
   Deputy Director
   Ceylon Institute of Scientific
   and Industrial Research
   Colombo, Srilanka.

4. Dr. T.S. Natarajan
   Dept. of Physics
   Indian Institute of Technology
   Madras, India

5. Dr. A.W. Khankhanzada
   National Centre of Excellence
   in Analytical Chemistry
   University of Sind
   Sind, Pakistan

6. Dr. Rong Rujkorakarn
   Dept. of Physics
   Khonkaen University
   Khonkaen, Thailand

7. Dr. Rezwan Khan
   Dept. of Electrical and Electronics Engg.
   Bangaladesh University of
   Engg. and Technology
   Dhaka, Bangaladesh

8. Prof. J. M. Pradhan
   Central Dept. of Physics
   Tribhuvan University
   Kirtipur, Kathmandu
   Nepal.

Eligibility :

Teachers teaching in science campuses and persons working in various institutions/ organizations who have some knowledge of electronics are eligible to apply. But preference would be given to those who have interest and experience in instrumentation activities.

APPLICATION FOR ENROLLMENT

To

The National Workshop on Educational &

Scientific Equipment

Kathmandu

August 17-21, 1989

1. Name:

2. Designation and Organization:

3. Mailing Address in Full:

4. Educational Qualification:

5. Experience:

Please, register me for the above workshop.

Signature of the applicant:

Date: