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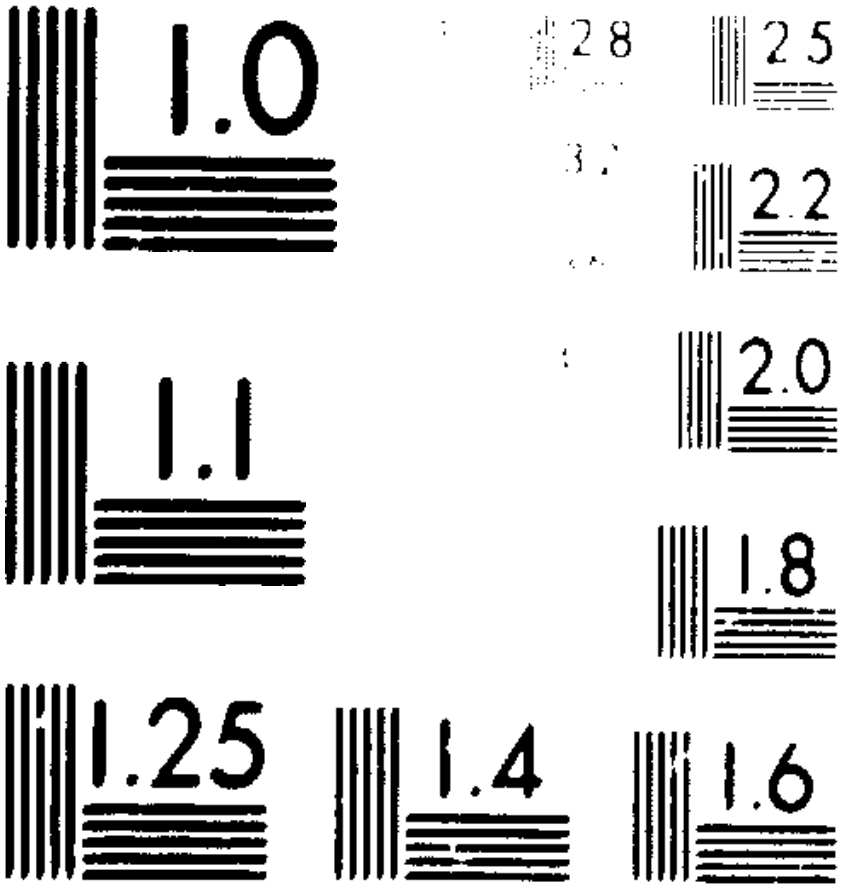
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ASSISTANCE TO
TANZANIA RESEARCH AND DEVELOPMENT ORGANIZATION
(TIRDO).

Tanzania, TIRDO. REPORT ON
ELECTRONICS AND INSTRUMENTATION
(DP/URT/78/019/11-04/A)

Prepared for the Government of Tanzania*

by

SITAL K. SURI
UNIDO Expert

Dar es Salaam: November 1981

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SUMMARY

TIRDO is planned as a multi-branch, multi-purpo ; institution to provide technical services, research and development in support of Tanzanian industry and of the long term industrialisation plans for the country.

TIRDO is organised along the following lines. It will have the departments of

1. Chemistry/Analysis
2. Engineering
3. Food Technology
4. Fibres
5. Information & Extension Services

It is obvious that the first four departments will have laboratories where research relevant to the industrial development of the country will be conducted as well as test and analysis to solve the problems of the industry in their day to day work or in order to control the quality of the products.

Since the Tanzania Bureau of Standards is functioning in temporary accommodations while its permanent buildings are under construction and as it has started writing the specifications for industrial products, so in due course it is expected that industry will need to depend upon a test and analysis laboratory to help it come up to the standard specifications. TIRDO is expected to perform this function since its main purpose will be industrial research.

To perform their functions according to the requirements of the day, a number of highly sophisticated instruments and equipment is being ordered with the help of international agencies. It is therefore essential to have a Centre of Electronics & Instrumentation organised in TIRDO right from the beginning so that instrumental support is provided to its industry-oriented departments in the first commissioning and maintenance of the equipment and also to develop instrumentation for specific purposes where a commercially made apparatus may not be easily available or where the urgency of requirement may demand it. The emphasis on electronics can be explained by the fact that electronics has found its way into every sector of instrumentation because of its multi-faceted applications as also its convenience.

Another logical function for this department will be the breakdown maintenance of not only electronic but other multi displinary apparatus in TIRDO's own laboratories and that of industrial quality control laboratories and also of the hospitals. This work is popularly called "Repair" although it may neither be routine nor repetitive due to the staggering variety of apparatus used in scientific pursuits today.

It has been noticed especially in Tanzania that due to the difficult foreign exchange position, instruments which broke down after their first run or which did not function at all, continue to do so due to lack of expert attention or non-availability of spare parts. An important function of this centre will be to assess the requirements in advance, to the extent possible, and create a stock pile of common components and also the capability to fabricate hard-to-get components for specific needs.

An early establishment of such a Centre will allow TIRDO to project itself as a major benefactor of industry. It will also give the opportunity to its instrumentation staff to get familiar with expensive instruments during their installation and commissioning.

INTRODUCTION

The present mission is concerned with the survey of the existing major testing and analysis instruments used for both routine testing of industrial products and for quality control. The ultimate purpose is to plan a Center for their preventive and breakdown maintenance as an in-house facility. The mission is also expected to explore the instrument maintenance requirements of the various other testing and research laboratories in and around Dar es Salaam, in the first instance, especially those of the University, the Tanzania Bureau of Standards, The Government Chemist, Food & Nutrition Laboratories and the Muhimbili Hospital Departments who may in future like to draw upon the spare capacity of this Centre.

The Expert arrived in the field on September 18, 1981 to start the first part of his mission of conducting a survey and making recommendations as listed in the job description (Annex 1) and would leave for Vienna for de-briefing on November 9, 1981.

In the absence of a technical counterpart, the Extension Officer from the Information Department was seconded to the expert for part of the time to help in making contacts with the local institutions and to accompany him on some of the visits.

OBJECTIVES AND WORK PROGRAMME

1. Objectives

As mentioned in the job description (Annex I) the main objectives of the mission are:-

a) To review the TIRDO research plans and proposed laboratory equipment and analyse the calibration, test and maintenance and repair capabilities necessary to support these plans.

b) To survey Tanzanian industries and institutions, appraise the need for calibration, test, maintenance and repair services and recommend to TIRDO its role, if any, in providing such services, taking into account existing and planned capabilities, in country investment required and probable return on investment.

c) To advise TIRDO on the electronic design and fabrication activities which should be undertaken both to enhance the laboratory functions and to serve industrial needs in Tanzania.

d) To develop a five year work programme and training schedule for the implementation of these recommendations.

e) To prepare detailed lists, and specifications for equipments and supplies required to fulfil the work programme.

2. Work Programme

At the commencement of the mission, the Expert was given the following work programme by the Chief Technical Adviser Mr. C.A. Stone, the details of which have been taken into account, both in preparing this report and in providing other relevant information during and at the conclusion of the assignment:-

a) To study the general activities and set up of TIRDO with special reference to the equipment already ordered for the Chemistry & Analysis Department with a view to their first commissioning and maintenance requirements.

b) Conducting a study on the test and measuring instruments expected to be purchased for the other divisions of TIRDO i.e.

1) Textiles
2) Fuel & Ceramic Technology
3) Food Technology

c) Paying technical visits to all or most of the following institutions

1) Tanzania Bureau of Standards
2) The University of Dar es Salaam especially the departments of Chemistry, Chemical Engineering, Electrical Engineering and Physics.
3) The Government Chemist
4) National Food and Nutrition Laboratories
5) The Dar es Salaam Technical College
6) Tanzania Breweries - Dar es Salaam
7) Tanzania Cigarette Factory - Dar es Salaam
8) Tanzania - Italian Petroleum Refinery DSM
9) The Bora Shoes Company
10) The Textile Industry of Tanzania
11) Tanzania Pharmaceutical Industries
12) The Daikin Refrigeration Industries
13) The Tanzania Steel Mills - Dar es Salaam
14) The Agha Khan Hospital
15) The Muhimbili Medical Centre and Hospital; Depts. of Pathology, Microbiology, Eye and Physiotherapy and Operation Theatres.
16) Faculty of Agriculture, Morogoro
17) The Aerado Corporation

d) In each of the institutions mentioned above, to investigate:-

1) The types of testing and measuring instruments especially pertaining to process control instrumentation available at present and in near future.
2) Procedures and problems relating to their maintenance and repair.
3) Local facilities available for maintenance and repair in terms of staff and physical resources
4) The costs incurred and charges made.

e) Investigation of the facilities available in the manufacturers and agents shop, if available.

f) Preparation, before leaving Dar es Salaam, of a final report on the consultants findings and recommendations.

ACTIVITIES AND FINDINGS

1. General Background

TIRDO was established by Act No.5 of the Parliament which took effect from April, 1979. Its broad functions comprise those of a research laboratory as well as an industrial test laboratory. It is expected to provide technical services to the Industry by locating sources of up-to-date information in more advanced countries on specific industrial problems and also to monitor and co-ordinate the applied research carried out within Tanzania on behalf of or for the benefit of Government of Tanzania.

It is designed to be a multipurpose institution and its present salary budget alone exceeds one million shillings annually.

Due to the vast sweep of the apparatus already ordered or expected to be ordered through UNDP and through the assistance of other multilateral and bilateral agencies and due to the advanced technology of modern instruments, the work of their maintenance will be at a much higher level than what the popular, though inaccurate word "repair" would seem to suggest. This word is generally applied to jobs of a routine and repetitive nature e.g. as in telecommunication equipment, while in the case of a research laboratory, the instruments have to be taken care of on an individual basis and both the type of equipment and its make may not repeat at all. What is visualised is a high-level maintenance service along with adjust-calibration capability on jobs which will comprise all physical parameters and where the types of instruments will be from different manufacturers in advanced countries and which may be assembled in a different manner even though the name or end-measurement may be similar in nature. In such cases, each out-of-order instrument has to be treated as a short applied-research project where the faults may have to be searched out and then proper replacement spares located or improvised and finally the apparatus must be adjusted properly to conform to expected tolerances.

Keeping these objectives in view and as per the terms of reference of this assignment, a close study was made of the research apparatus which will be the first to arrive and where assistance in commissioning and close co-operation with the company's installation staff is needed. Annex II are listed the major equipment proposed or ordered for the Chemical and Analysis Department and the Information Department.

It is also planned to provide service to other institutions and to industry by the Electronics and Instrumentation Centre. A catchment area should be explored in and around Dar es Salaam in the first instance to identify potential users of the service. There could be initial introduction of this service with a collection and delivery service as the transportation bottlenecks due to petrol rationing may be a limiting factor in the case of some organisations who may otherwise be able to benefit from the service. The service should be gradually extended to other areas of Tanzania depending upon the availability of staff, funds and transportation. The continual purchase of spares by donors or through a proposed UNDP/UNIDO convertible revolving fund generated from the sale of the services will be required.

The attached list of apparatus ordered for TIRDO and already existing in the laboratories of the other institutions visited by the Expert may pose a challenge to maintain them in a country whose local market has great difficulty in maintaining supplies of electric bulbs, plugs and sockets not to say of specialised spares, but it has to carefully plan its initial purchases so that a considerable range of apparatus is covered. Also since this Centre is proposed to be run at a higher level than any visited in Dar es Salaam so far, the inputs have to be some what greater than normally estimated for such centres in semi-developed countries.

It is proposed that there would be two levels at which the TIRDO maintenance service will be offered. A third, more sophisticated level, would not be undertaken for a number of years.

a) Low-level maintenance

This will be primarily meant for appliances and dvices which do not measure anything but provide useful and convenient operating conditions and infra-structure, such as temperature-controlled ovens, controlled water baths or oil baths, centrifuges, vacuum pumps etc.

b) High-level maintenance and adjustments to Calibration against Standards

This may include commercial grade instruments which make measurements of various parameters such as length or mass or frequency or such derived parameters like acidity, alkalinity, or instruments like flame photometers, spectrophotometers, gas analysers, etc. where reference to a secondary standard is required.

c) Complete instrumentation systems

It is proposed that these may be contracted for maintenance to the original manufacturers, as it has been found to be generally more economical or else to call the specialist from the company, whenever needed. This would apply to computer systems, Electron Microscopes, Xray Diffraction, Mass spectrometers - N.M.R. etc. which are highly specialised systems. To carry out these activities, three levels of staff are visualised:

a) Technicians

Who are good fitters and can disassemble and assemble mechanical and electro-mechanical systems.

b) Technologists:

Who will guide the technicians in doing low level maintenance as stated above and who will help the engineers/scientists in fault analysis work and in disassembly and assembly of delicate apparatus.

c) Engineers/Scientists

Who would do the actual fault diagnosis in a variety of physics-based apparatus in the high level category of maintenance. They should be able to work independently starting from basic principles on apparatus which they may not have handled earlier.

Training, both theoretical and practical, for the last two categories of workers will be provided initially by the UNIDO Expert and the promising ones may be sent for training to an institution specialising in instrumentation and at manufacturers works either during their regular customer-courses or when a major item or ordered equipment is due for delivery.

The desirable qualifications and the numbers required are given in Annex III. This staff level should be reached by 1984 so that a fully trained and qualified centre is operating in 1986. Advertisements for two posts has been made and staffing is expected to begin in 1981 or early 1982.

In all the institutions visited, the concept of instrument maintenance, both preventive and breakdown type, was accepted but most of them were unable to implement it themselves due to various constraints and they welcommed the proposed Centre at TIRDO. The Centre could provide them with the much needed relief from dependency of the company specialists and the consequent release of foreign exchange. In cases where the manufacturing companies agreed to send their specialists, the costs were excessive, since they include air fares and living expenses in addition to fees.

The Tanzanian investment in equipment which is not functioning properly or is out of order or is not repairable is quite large.

2. Technical Specifications for the Test Equipment

a) Electrical and Electronic Apparatus

The specifications for test equipment, instruments supplies and laboratory fittings needed for fault diagnosis have been prepared in the form of purchase requisitions and submitted to UNIDO/Vienna.

The nature of this work will be such that this list may have to be enlarged depending on the complexity of the arriving apparatus as technology keeps changing at a fast pace. Certain specific spares of the high mortality type, will be ordered later, as soon as the service manuals of the new apparatus become available. Most instruments now come only with operators manuals and this lapse should be rectified as early as possible.

b) Mechanics Workshop

A mechanical workshop with turning, shaping, grinding, welding and painting and such other service will be needed as an occassional support facility and a liason should be established with a nearby facility until such time that the TIRDO shop is operating. The University of Dar es Salaam would be a suitable place for occassional work of this nature.

c) Tools and Spares

For a work involving by its very nature, disassembly and re-assembly of all sorts of instruments and appliances, some of them extra delicate and some of them of sturdier construction, it is necessary to have both light and heavy tools in the relative sense. A few sets of hand-tool kits will be necessary so that the trainee engineers and technicians would have an exclusive set to use although the installed and light mechanical facilities will be used by all of them.

Again, a variety of mechanical, electrical and electronic spares of a common nature are listed in the first instance. More specific spares will be ordered for the planned maintenance of certain instruments which are used intensively, as soon as their service manuals become available.

As this Group has to proceed on the basis of instructions contained in the service manuals and since these are to be returned to the owner of the apparatus when the job is done, access to a photocopy facility will be needed to copy out the necessary diagrams for the purpose of marking on them the changes made in any particular apparatus for future guidance. In case the same instruments are brought again but also to build up a collection of circuit diagrams so that similar apparatus coming from other sources but without proper manuals, can also be handled effectively. Further more this will be a useful source of technical information for purposes of training of staff.

d) Furniture

Suitable work benches, closed storage cabinets and shelving are not presently available in Tanzania. Work efficiency, job control and security will all benefit greatly from the importation of these items.

Three level work benches are required for proper positioning of test equipment, electrical supplies and the instrument being serviced. Open racks (obtainable locally) are required for storage of test equipment and instruments awaiting service. Closed, lockable cabinets are needed for delicate and calibration equipment and storage is also needed for components, spare parts, cables, etc.

Filing cabinets have been suggested for storage of instruction manuals and service records while card index cabinets will have cards on which will act as a convenient inventory of all instruments in TIRDO as also the data on instruments which may be contracted for maintenance.

3. Manufacturers or Suppliers

As stated in the Recommendations, later on, it will be desirable to restrict TIRDO purchases of instruments to, say, three countries, in order to benefit from a reduced inventory of spares, advances in technology and for ease of continued maintenance. Tanzania already suffers from a surfeit of makes and models and countries of manufacture depending on the donor countries or the indentors choice, which leads to serious difficulties to keep them functional during their useful life span.

4. Space requirements

Since this Centre is expected to precede the other R&D laboratories, it is necessary to establish initial operations in a residential cottage. The furniture estimates are therefore based on the rooms available in such a cottage. When space is allocated in the main laboratories it will be desirable to have continuous or at least adjacent space central to the other departments of TIRDO.

Delicate and costly electronic apparatus and certain spare parts are vulnerable to the excessive humidity of Dar es Salaam which is a sea-port of the tropics. A relatively in-expensive arrangement to keep the moisture content low in storage will be to block normal ventilation and use heaters and fans to drive out

moisture at night. However, while working on such apparatus or calibrating them under standard conditions of temperature and humidity it would be necessary to use condensable-vapour type of de-humidifiers in addition to air conditioners.

b) Electrical supplies

All work benches for instrumentation work will be fed from mains voltage stablisers so that any fluctuations in the main supply do not seriously affect the on-going work which may extend to a few days or a few weeks depending on the nature of the damage. The motorised electrical tools will be fed from isolating transformers to avoid the risk of shocks. The power sockets will be adequately fused to minimise or eliminate the risk of overloading the wiring especially while in residential premises which are not wired for laboratory type of work.

5. Staffing

Since the work is envisaged to be done at two levels, a three-tier arrangement is suggested for the staff. The middle level acts both as senior technician and junior engineer and is available to the other groups depending on the work load at any time. Also it is in the nature of things that as the higher level staff gains work experience, they will get attractive offers from elsewhere and tend to migrate. The middle level staff is then expected to cover the dislocations so caused and provide candidates for advanced training and promotion.

Three Engineers, two Technologists and three Technicians are expected to share the work load of the Centre when all TIRDO facilities are in operation. One of the Engineers will become the Head of the Centre. Since adjustments for calibration purposes are intended to be made for all instruments which come for maintenance, it will be desirable to send the engineers, one at a time, to the Metrology Laboratory of the Bureau of Standards in Dar es Salaam so that they become familiar with the calibration standardisation procedures followed.

Clerical support staff will be necessary to keep accounts and the inventory of the spares as well as to maintain a Central Inventory of instruments and other related work. Some non-skilled help will be needed to carry the apparatus from the other department to the Instrumentation Department and vice versa.

6. Central Inventory of Instruments and other Records

It is proposed to keep a record of all instruments indented by TIRDO, with the help of inventory cards which have been adapted from the book index cards used by the Information Department. A typical format is shown in ANNEX IV. There will be two advantages. One would be that at one central point, after proper classification, information will be available of all instruments of any one type and their location in the laboratory. This will help in inter-department loans when one department may not be aware of what exists in the other departments by way of instruments which could be used by more than one department when such a need arose. Secondly, this centralised information will be useful for perspective planning with a view to their long term maintenance and procurement of spares in anticipation of their breakdowns.

All instruments presented for servicing will be recorded in the Customers Instruction Sheets/Work Order Book shown in ANNEX IV. The essential data of the apparatus and the customer's complaint will be recorded in his own hand and signature, after a demonstration of the complaint. These sheets will be bound in book form with duplicates acting as record and the original being given a receipt for the apparatus while it is under repair. This receipt will be produced by the owner to claim the instrument after repair - when it will be returned after giving a demonstration of its working and customer's signature obtained on the record sheet.

The work order book will be serially numbered with one book containing 100 entries. This serial number will be carried over to the history card for each instrument serviced, on which all necessary details of the diagnostic testing or actual adjustments made would be recorded for future reference.

Since the supply of technical information concerning instruments will be a necessary corollary to instrumentation work, attempt will be made to keep catalogues and information sheets or new apparatus for the benefit of the users.

RECOMMENDATIONS

1. It is strongly recommended that TIRDO should implement the plan for the Instrument Maintenance Centre as quickly as possible. Qualified staff should be recruited and the UNDP/UNIDO Project should procure the equipment and supplies identified by this mission. Facility preparation including electrical wiring should be completed before the arrival of the expert and the equipment for the Centre.

2. As a matter of policy whenever an instrument is purchased, a service manual is obtained along with it as distinct from the operators manual which is generally supplied. This manual not only helps in the quick location of trouble in case of breakdown due to use or accident but also helps the instrument maintenance Centre to identify spare parts which are liable to early breakdown by their very nature and to do their advance purchasing. The service manual should invariably stay with the instrument so that the user can consult it for the proper use of the apparatus or for its elementary preventive maintenance, to the extent, indicated there, for visible troubles.

3. There should be a Central Inventory of all instruments. This function should be performed by the Instrument Centre by obtaining the data from the user departments and classifying it properly. New instruments should be entered on a running register more or less like the acquisition of books in a library i.e. with an accession number, date of arrival and particulars of the department to whom it is issued, so that the relevant information for classification purposes can be extracted later on. With this inventory, it will be possible to keep track of of the movement of the instrument as well as its conditions and do advance planning for their maintenance.

4. All instruments should have an identification tag fixed with wire to an accessible and visible support, indicating the name of the apparatus, date of arrival (numerals for month and year only) and the indenting department. This will help in the inventory and also in the periodic inspection, at yearly intervals, without reference to stock registers, a procedure which tends to be difficult as the number of instruments increase.

5. All instruments above a certain money value e.g. 5000 shillings should also have a price tag permanently fixed on them. This will help to have a healthy respect for the expensive apparatus and will also identify apparatus which needs to be saved first in times of emergency such as flood or fire.

6. To reduce large inventories of spares and special tools and test apparatus, it is suggested that the future instrument purchases be restricted to a few countries wherever possible. It is easier to maintain similar apparatus and also better contact with the manufacturers is established through their publications, field staff, and training because of continued association.

7. Service History cards should be maintained for all instruments. This will save time on repeat calls and recurring defects on similar instruments can be analysed. This information can be used as a feed back to the manufacturer or for advice to the user to change his working procedure or to avoid troublesome instruments in future purchases. This can lead to better instrument evaluation in the long run and also serve as a data for training staff.

8. Instruments have a limited life. They also become obsolete due to advances in technology. The use and the consequent wear and tear also takes it toll. To this may be added damage due to indifferent storage. It is therefore necessary to have the instruments inspected for their "health" say in January of every year, by specialists from Instrument Maintenance Centre. The inspection should include repairability or write-off, transfer from one department to another, and physical removal of instruments which are unfit to use.

9. It is strongly recommended that instruments are not "opened up" by the users. The use of wrong tools, inadequate tools or lack of knowledge of delicate mechanisms can damage the instruments so much that they may become uneconomic to repair.

ACKNOWLEDGEMENTS

The Expert wishes to thank Mr. A.J. Tingo who acted as a part time counterpart. While working as an Extension Officer and attached as a formal counter part to the Extension Expert, Mr. K. Klintoø,, he was most helpful in arranging all the visits made in Dar es Salaam and accompanying him wherever possible or making alternate arrangements when he could not go. The Expert is obliged to Messrs. Victus, Nyonyi and Makinge for accompanying him on some of the visits so that it was easier for him to have a meanful dialogue with the visiting institutions.

The Expert appreciate the contacts provided by the Director General, Mr. A.M. Tarimu at the highest level whenever requested and his helpful attitude all along.

The Expert wishes to thank Mrs. Nyonyi, the Documentation Officer who very kindly provided all the catalogues and other data available on Tanzanian Industry, in her fledgling department. The Expert also wishes to thank Mr. K. Klintoø for many meaningful discussions and for his active co-operation in adapting the index cards designed by him at D.T.O. Denmark for use of library books, also for instrument classification and inventory.

Finally, the Expert is especially indebted to Mr. C.A. Stone, the UNIDO's Chief Technical Adviser of the Project for his constant guidance and advice in all maters concerning the work programme and doing most of the spade work for the visits. Without his active support, understanding and helpful co-operation, this project could not be completed in the alloted time.

ANNEX I

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT OF THE UNITED REPUBLIC OF TANZANIA

26 December 1980

Job Description
DP/URT/78/019/11.04/A 31.3.J

Post title	Expert in Electronics and Instrumentation
Duration	Two months
Date required	June 1981
Duty station	Dar es Salaam with possibility of travel within the country.
Purpose of Project	To assist the Tanzania Industrial Research and Development Organization (TIRDO)
Duties	The expert will work under the general supervision and guidance of the Senior Technical Adviser to TIRDO and in close cooperation with TIRDO management and staff. The expert will specifically be expected to:

1. Review TIRDO research plans and proposed laboratory equipment and analyse the calibration, test, maintenance and repair capabilities necessary to support these plans.

2. Survey Tanzanian industries and institutions, appraise the need for calibration, test, maintenance and repair services and recommend to TIRDO its role, if any, in providing such services taking into account existing and planned capabilities, in-country investment required and probable return on investment.

3. Advise TIRDO on the electronic design and fabrication activities which should be undertaken both to enhance the laboratory functions and to serve industrial needs in Tanzania.

4. Develop a five year work programme and training schedule for the implementation of these recommendations.

5. Prepare detailed lists and specifications for equipment and supplies required to fulfill the work programme.

The expert will also be expected to prepare a final report, setting out the findings of this mission and his recommendations to the Government on further action which might be taken.

Qualifications — A university degree preferably in electrical engineering/electronics and five or more years of industrial or laboratory experience in the design, construction, testing, maintenance and repair of a broad range of instrumentation and equipment. Experience in developing countries will be an asset.

Language — English.

IT IS DESIRABLE THAT THE CANDIDATE CAN FULFILL A FOLLOW-UP MISSION OF 12 MONTHS OR LONGER AS PER JOB DESCRIPTION DP/URT/78/019/11.04/B.

ANNEX II — Major Apparatus Being Ordered or Requested for TIRDO Which Will Need Maintenance

Rank Xerox Microfiche Printer
Rank Xerox Photocopy - floor model
Gestetner stencil scanner
Rank Xerox Photocopy - table model

SP-8 250 U.V. - visible recording spectrophotometer
SP-2000 double beam grating infrared spectrophotometer
HP 9825 desk top calculator
SP-9/800 Automatic Absorption Spectrophotometer
gas chromatograph - Pye Unicam
high pressure gas/liquid chromatograph
L.C. - F.L. detector
semi analytical electronic balances
pH meters
Abbes refractometer
polarising microscope - Binocular
flame photometer
digital polarimeter
spectrophotometer
electronic controlled oven
digital read out centrifuge
tristimulus stimulator
fractional still

Smaller items

Double beam balances
Waring Blender
cathetometer
gravity feed de ioniser
light spot galvanometer
energy regulators
magnetic stirrers
Simpson Multimeter
industrial viscometer
X-Y recorder
speed programmer
melting & boiling point apparatus
metal analysing spectroscope
freeze drying apparatus

ANNEX III STAFF QUALIFICATIONS

1. Engineer or Scientist

Electrical Engineer, Electronics Engineer or Physicist. Combination any two disciplines preferred. Engineering degree or post graduate degree in Physics, like M.E. or M.Sc. Experience in handling Electrical or Electronic or Testing or Measuring Instruments or with Metrology apparatus.

Experience of working in a company dealing with sophisticated scientific instruments, in installation calibration or servicing.

Number required: 3

2. Technologist

University degree with Physics, Chemistry or Mathematics and Diploma in Engineering (Electrical or Radio or TV technology, with experience in a University or commercial laboratory.

Number required: 2

3. Technician

High School (Form VI) in Science subjects. At least three years of laboratory or workshop experience in a Radio or TV shop or a Hospital Laboratory dealing with the maintenance of Electro-medical apparatus.

Number required: 3

In all the above categories, aptitude for manual work and handling of fine and delicate mechanisms is a definite requirement. Research minded or theoretician types will not suit this profession when dismantling, re-assembly and re-adjustments is a necessary activity in every case.

ADVERTISMENT FOR TIRDO ELECTRONICS STAFF

13-10-87

TIRDO

TANZANIA INDUSTRIAL RESEARCH & DEVELOPMENT ORGANIZATION

This Organization is being developed in Dar es Salaam to seek solutions to technological problems experienced by existing industries, to develop or adapt processes that will be required for the establishment of new industries and to assist with their application. Offices, laboratories and staff houses are being constructed in adjacent localities at Msasani, Dar es Salaam. Applications are invited for suitably qualified Tanzanians for the following posts:-

RESEARCH AND DEVELOPMENT OFFICER
(One post)

Qualifications:
Applicants should be holders of a good (at least 2nd class) degree in Electrical Engineering with Electronics as part of his university training, or with electronic work experience following the science degree award.

Duties:
To oversee the first commissioning, operation and maintenance of electronic test equipment, to undertake the fault diagnosis, do repairs and calibration of scientific and industrial instrumentation, to keep records and inventories associated with electronic repair and maintenance services and to undertake further training in electronics as deemed necessary.

RESEARCH AND DEVELOPMENT OFFICER GRADE III

Salary:
MSU 6 i.e. Sh. 28,140/ x 1,260/- to 34,440/- p.a. for graduates without work experience.

RESEARCH AND DEVELOPMENT OFFICER GRADE II

MSU 7 i.e. Sh. 35,640/- x 1,440/- to Sh. 42,840/- p.a. for graduates with an M. Sc. degree or equivalent post graduate qualifications in electrical engineering including electronics or for graduates who possess a first degree with two years work experience in electronics and/or electrical instrumentation.

LABORATORY TECHNICIAN GRADE I
(One post)

Qualifications:
Applicants should possess a City and Guilds part II Certificate in Electronics or equivalent qualification with 3 years experience in the operation, calibration and/or maintenance of Electrical/electronic equipment used in laboratories and industry.

Duties:
To assist the Research and Development Officer in disassembling and assembling of mechanical electrical, electronic or other multi-disciplinary laboratory instruments for maintenance, repair or calibration work.

Proficiency in the use of mechanical hand tools and electrical tools, soldering work on delicate electronic instruments and ability to fabricate simple mechanism by duplicating worn-out parts.

Ability to read schematic circuit diagrams is important.

Salary:
MSU 6 i.e. Sh. 28,140/- x 1,260 — Sh. 34,440/- p.a.
Applicants from the Civil Service and those working in Parastatal Organizations should channel their applications through their respective Heads. All applications should be accompanied with photostat copies of certificates and other supporting documents including curriculum vitae, and should reach the undersigned not later than 3 weeks from the first appearance of this advertisement.

The Director General,
Tanzania Industrial Research & Development Organization,
P.O. Box 23235,
DAR ES SALAAM.

Those who have already applied for similar positions should re-apply.

ANNEX IV/A

WORK ORDER BOOK

Instrument Maintenance Centre

(TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT ORGANIZATION)

68984/68822

Customers Instructions

Job No.

Name of Person:

Dept and Address:

T.F. No:

Name of Instrument:

Maker and Country:

Model & Serial No.

Cost of the Instrument: Manual: Yes/No

Age: Last Service detail:

Out of order since: By whom, when, where

Complaint. (Please give a demonstration)

Any missing parts: Yes/No:

Job booked by
(Signature)

Customer's signature & date

Work completed) Sign
) &
Manual recd:) date

Instructions Overleaf: Please bring back this receipt.

ANNEX IV/B

INSTRUMENT HISTORY CARD

TANZANIA INDUSTRIAL RESEARCH & DEVELOPMENT ORGANISATION
(TIRDO)

INSTRUMENT MAINTENANCE CENTRE

SERVICE HISTORY CARD

INSTRUMENT NAME:	MODEL-SERIAL NO	CONTRACT NO
MANUFACTURER:	INSTR. NO	TIRDO INSP. NO
OWNER: Name, address, PoB No, telephone, telex	ARRIVAL DATE	NO INSTR SAME TYPE

MANUAL AVAIL YES/ NO	Price	TIRDO Workshop	TIRDO Dept.	CLIENT DEPT.

APPLICATION-PURPOSE:

APPLICATION BY OTHER BRCH

INSPECTION REPORTS:

ANNEX V VISITS TO INSTITUTIONS

1. Visit to the Laboratories of the Tanzania Breweries

The laboratories were located in two areas: one was the laboratory for day to day analysis and the other one with more sophisticated instrumentation was called the Group Laboratory.

Apparatus typical of a micro biology and Bio-Chemistry Laboratories was installed. The following apparatus was installed:

Carbon Dioxide Analyser of Cambridge make
SP-500. Pye Unicam Spectrophotometer
Lovibond Tintometer
PH meter of Radio meter make
Mettler Single Pan Balances
Centrifuges
Controlled temperature ovens of Memmert make
Single point culture-growth ovens
Kjeldahl apparatus

On the production side, the following instruments were installed:

Pneumatic Temperature Controllers of Taylor make
Thermocouple thermometer for spot temperatures
Pressure Gauges.

The laboratory staff was interested to know that TIRDO was planning to set up an Instrument Maintenance Service and they would be making use of such a service if available.

2. Visit to the Laboratories of Tanzania-Italian Petroleum Refinery (TIPER)

The refinery was shut down for maintenance and hence the laboratories were not functioning. The following instruments were seen.

Dead weight Testers for Pressure Gauges
pH meters of Beckman make
Flame Analysis apparatus
Spectrophotometer Model D.U. of Beckman make
Auto titrator
Infra red spectrophotometer SP-1000 of Unicam make
Moisture Analyser
Thermostatic baths
Petroleum viscosity meters'
Liquid gas chromatographs

Since the Refinery is a continuous process industry they had to keep the analysis equipment in good running condition whatever be the costs and they had to refer major problems to the principals in Italy. They showed interest in the setting up of a facility in Dar es Salaam itself which they could use as well in time of need.

3. Visit to Bora Shoes Company

Since there was no control laboratory attached to this factory the manager showed us the instruments installed on the production machines which were primarily pressure and temperature gauges.

They were interested in the periodic calibration of these gauges and refresher courses for their technicians in the handling and preventive maintenance of such instruments.

4. Visit to the Tanzania Bureau of Standards

The Bureau of Standards is presently located in the premises of TEXCO while their own buildings are under construction on the Airport Road. Since the Swedish Development Agency is funding this entire project including advisors, it is expected that high level apparatus for the measurement of length, mass and volume as well as those for the measurement of D.C. Voltage and resistance, AC Voltage and Wattage and Temperature & Pressure measurement apparatus will be arriving soon.

These will be installed in air conditioned and humidity controlled rooms. It is expected that they would use the expertise of TIRDO in due course for the maintenance of these sophisticated metrology instruments.

5. Visit to the Government Chemist and the Laboratories of Tanzania Food and Nutrition Corporation

These laboratories are located side by side in temporary accommodation next to the Ocean Road Hospital.

The Government Chemist receives samples from the regulatory bodies of the Government such as the Customs, Police or Purchasing Authorities for food or expert of food products for their chemical analysis. Those concerning food items are passed on to the Food & Nutrition Laboratories. The TFNC also gets aid in the form of instruments from the United Nations Children's Fund. Both these laboratories are in urgent need of maintenance help for instruments since their dependance on the suppliers representative made them completely helpless since the agents engineers visited only once or twice a year and the equipment lay out or order in the meantime. The following types of apparatus was seen.

Voltage Regulators
Hydrogen Generator
Spectrophotometers - Ultra-violet and visible range i.e. SP-100
Pye 8000, U.V. Recording type
Pye SP-600) Prism types
Pye SP-500)
Pye SP 200 G Grating type for Infra Red work
Pye 104, Gas chromatograph.
Zeiss fluorimeter
Zeiss polarimeter
pH meter of metro ohm make
Automatic Titrator
Monopan Balances
Oscilloscopes with polarograph amplifier

TFNC has more recent equipment, some of it through Dutch aid, such as:

Monopan Balances of Oertling make
Monopan Balances of Sartorius make
Water purifier - De-ionisation - Distillation
Ovens, Centrifuges
Freeze drying apparatus
Vitamin Analysis spectrograph SP 6-400
Fibre Digester
Battery Charger
Sieve and Sieve Shaker
Blood analysis apparatus
Liquid Chromatograph - U.V. Spectrometer combination
Thermometers & Heating Mantles

6. Visit to Muhimbili Hospital Departments

The following Departments were visited

1. Eye Department
2. Physiotherapy Department
3. Operation Theater
4. Pathology, Microbiology, Hematology.

The last named set of laboratories were located together. Since they are aided by the Federal Republic of Germany, they had the maximum concentration of analysis and measuring instruments that we saw anywhere in Dar es Salaam. The Doctors were very anxious to have support facilities for their maintenance. The following types of equipment was seen.

Coulter Counters for blood indices
Shandon Electrophoresis
Microtomes
Auto technicon tissue Analysers
Ultra high speed vacuum centrifuges
Flame photometers of B. Lange
Spectrophotometers
Monopan Balances of Mettler
Controlled temperature baths
High Pressure sterilisers for Laboratory use
Sterilising Ovens
Fast cryogenic microtome
A variety of Monocular and Binocular Microscopes.

The Eye Department was in immediate need of help in the case of their

Eye examination Microscopes
Eye Cataract Cautery and
Opthalmoscopes
which were either non-functional or whose optical parts had not been clean d for a long time.

The Physiotherapy Department had the following apparatus.

Ultrasonic Therapy
Short wave Therapy
Inducto thermy
Impulse meter
and again as is commonly observed, from a variety of countries, which makes the availability of service facilities and spares a difficult matter. Most of the apparatus had been supplied by Holland (Oversees) Agencies of Dar es Salaam.

7. Visit to the Agha Khan Hospital

This is a private general Hospital located on Ocean Road. It has the usual Xray and some emergency equipment and a maternity wing. They are expecting to get a large amount of cardiology equipment as suggested by the Kaiser Foundation of USA although funded by UNICEF. This will include, cardioscopes defibrillators resusitators etc and this hospital expressed an interest in having contract services from TIRDO when it can offer them. TIRDO's staff uses this hospital most of the time, on payment by TIRDO.

8. Visit to the Technical College

The electrical Engineering Department which trains diploma holders did not hold much equipment. Infact whatever it had were rejects or worn out equipment from U.K.

However, the Electronic Engineering Section had a room-ful of electronic equipment from oscillators to VTVM's, Valve Testers and Oscilloscopes which needed expert attention, first inspection and then write off or servicing for those which were still serviceable.

9. Visit to the University of Dar es Salaam

At this University various departments have been adopted by various developed countries with the result that not only latest trends in laboratory Buildings and lay-out were visible but that latest equipment from these countries was installed and that too quite recently i.e. a few years old. The Physics Department is funded by Britain, the Electrical Engineering by the Federal Republic of Germany and the Chemical Engineering Department which is under construction is under-written by Switzerland and Norway. In each of these expatriate staff from

the donor countries have set up these laboratories and also do teaching work.

The Physics Department had a small maintenance shop to do its own and to some extent work of other departments but not on a regular basis. Again the Electrical Engineering Department was doing some work off and on, on a personal contact basis. Public address system of Police & Military bands and some motor winding work was stated to have been done. It was interesting to know that a couple of years ago they had initiated a survey of out of order equipments in the country but gave it up. The Chemistry Department had a glass blowing shop which would be a useful support facility for odd jobs.

9. Physics Department has the following types of equipment

Stroboscopes GR
Oscilloscopes
Nuclear Apparatus including a complete multichannel Analyser: Photomultiplier spectrometer with a liquid Nitrogen trap: Germanium point counter, Pulse height Analyser of 1000 channels and a computer.

Also seen were Gyroscopes, optical benches, Hydrogen discharge tubes: Discharge through gases at low pressure: Sputtering at low vacuum meters, rheostats etc.

Chemistry Department and Chemical Engineering had

Gas chromatographs
Viscosity measurement
Refractive index and liquid resistance measurement apparatus. Vacuum apparatus

A variety of Mettler Balances were seen in their Balance rooms. Also found were:-

Philips pH meters, Recorders.
Infra Red spectrophotometer SP-1800 of Pye Unicam
Old model NMR of JOEL make
Polarographs & Auto-titrators
Water baths, Heating mantles, Fraction collectors and vacuum pumps and Photocopy equipment.

10. Visit to Aeradio - a commercial firm

This firm acts as an agent for a number of suppliers and is a part of the I.A.L. group. The manager frankly stated that while they advertised all sorts of maintenance services, it was primarily to sell the apparatus. Their main repair work consisted of public address systems and communication equipment. For anything above this, they depended on an engineer of the parent company, based in Nairobi, if and when he came on a visit. With the foreign exchange being practically non-existent in Tanzania for the past two years, no company showed any keenness

to send a person. The rates for a visit were quoted around 1,200/- Shillings a day. The manager thought that it would be a relief if TIRDO could attend to some of the outstanding jobs for which they neither had the expertise or facilities or time.

11. Visit to the U.S.A.I.D. Mission to Tanzania

A contact was made with Mr. Goodwin of the U.S.AID Agency for Tanzania, who are giving a lot of aid in the form of Laboratory Instruments for Agricultural research.

He suggested that many of these institutions were in need of a specialist service for preventive maintenance and especially breakdown maintenance of sophisticated apparatus donated by countries like his - which were some of the finest apparatus produced in its category.

He identified TARO is Tanzania Agricultural Research Organisation in Dar es Salaam, The Pesticide Research Station at Tanga and the Veterinary Research station at Tanga who definitely have some very sophisticated apparatus. He provided the names of his contacts in the Ministry of Agriculture through whom the aid to Tanzania is channelled.

He also advised that if the Research Stations could not be visited on this mission, a telephone contact could be established and some written material sent to them about the services that TIRDO could offer specifically in instrumentation matter.

It is suggested that the TIRDO Extension Officer should make contact with TARO, get the addresses of the field stations and address them letters in the first instance similar or the same as the one signed by TIRDO's D.G.