OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

RESTRICTED

18 September 1986
English

FUELS AND APPLIANCE TESTING LABORATORY

DP/PHI/82/002/11-56/31.4.Z

PHILIPPINES

Prepared for the Ministry of Energy,
Bureau of Energy Utilization, Manila,
Philippines by the United Nations
Industrial Development Organization
acting as executing agency for the
United Nations Development Programme

Based on the work of G. S. Yamamoto, Short
Term Expert on Fuel and Appliance Testing Laboratory

United Nations Industrial Development Organization

Vienna

TABLE OF CONTENTS

PROJECT IN THE REPUBLIC OF THE PHILIPPINES

JOB DESCRIPTION

DP/PH1/82/002/11-56/31.4.Z

POST TITLE

SHORT TERM EXPERT/FUELS AND APPLIANCE TESTING LABORATORY

DURATION

0.5 MONTH

DUTY STATION

MANILA, PHILIPPINES

PURPOSE OF PROJECT

The purpose is to establish the necessary services and capacities in order to achieve better energy utilization in industry and to improve the performances of the sector.

DUTIES

Expert was attached to the Ministry of Energy and worked under the supervision of the Chief of Energy Conservation of the Bureau of Energy Utilization and the Chief Technical Advisor to supplement efforts of the long-term international experts of the project.

Expert was to:

1. Review design of fuel and appliance testing facilities and specifying instruments required for appliance testing.

2. Review the existing calorimeter room for testing room air conditioners and suggest further improvements for getting reliable results.

3. Recommend appropriate training program for BEU engineers in operation and maintenance of laboratory facilities.

BACKGROUND INFORMATION

Energy conservation is a relatively new area in the Government's program to reduce its dependence on import oil. In addition to its aggressive development of its domestic energy resources, the Government now wishes to embark on an energy-saving program through the improvement of efficiency in the use of fuels in major industrial enterprises.

Research and development undertaken within the last decade in industrialized countries has produced many new technological and non-technological techniques for the conservation and economical usage of energy in industry. Although information regarding such schemes is generally available, it has not yet been greatly extended to developing countries, partly because it has not been adequately disseminated to them or because these countries generally lack sufficient expertise to avail themselves of it. Technical assistance is, therefore, a valuable vehicle for parting new knowledge to the recipient countries and for creating both the expertise and the facilities where they are needed.

A practical way of achieving this goal is the creation of an institution which would gradually acquire a knowledge of energy management and conservation techniques and the skill of applying them to energy users. To this end, it is proposed to establish an Energy Management Consultancy Service (EMCS) in the country with UNDP/UNIDO assistance.

The principal objective of the EMCS will be to implement energy-saving measures among the industrial and non-industrial users. It will work towards that objective by developing a core of 15 specialists trained by a team of international experts to carry out energy audits and consultancies with local staff. This will entail the elaboration of general system

for the development, application and implementation of energy-saving measures and technology and the preparation of working manuals with methodologies. Local specialists will be trained by the EMCS and in factories. Furthermore, a laboratory will be established for the purpose of testing the efficiency of fuel utilization by energy-consuming equipment. Group training and fellowship will be organized by the EMCS for officials and managers to observe how other countries and selected industries deal with their energy problem.

Participated in the following:

In order to get background materials for the design and operation of the Fuel and Appliance Laboratory, the following visits were arranged by the Ministry of Energy, Bureau of Energy Utilization, during my stay in Manila.

They were as follows:

1. Bureau of Energy Utilization Laboratory
2. National Institute of Science and Technology
3. Philippines Appliance Corporation
4. Participation in meeting of the Association of Home Appliance Manufacturers for Room Air Conditioners
5. National Engineering Center, University of Philippines
6. Product Standards Agency, Ministry of Trade and Industry

Recommendation for Establishment of a Full Fledge Fuels and Appliance Testing Laboratories

A. Objective of the Laboratory

1. To provide a means for testing of fuels and certification facilities for appliances in accordance to internationally accepted standards of appropriate professional associations, institutions and recognized organizations for consumer durables and energy consuming equipment. The products to be covered are electric fans, blowers, water heaters, refrigerators, flat irons, stoves, lamps and ballasts. The objective is also to provide means of promoting product quality and increasing export efforts of non-traditional goods from the Philippines to developed countries.

2. To eventually be a regional testing center for Asean' group of nations with funding provided by bilateral/ multi-lateral basis from donor governments of developed world and international agencies.

3. To establish professional contact on a sustain and continuing basis with similar institutions throughout the world.

4. To participate and become members of professional international bodies to keep up to date in scientific and technical matters.

5. To establish close coordination with other national institutions in the Republic of the Philippines.

A. Objective of the Laboratory (cont'd)

6. To establish close working relationship and liaison with ETL Testing Laboratories or other recognized laboratories.

7. To provide and maintain secondary standards for calibration of commonly used parameters in the energy field.

8. In the course of time, it would be desirable to make the Fuels and Appliance Testing Laboratory an independent organization to operate and manage the laboratory testing only. Administration and regulatory functions shall be retained by the Ministry.

B. Administrative/Management Goals

1. A qualified technical expert (local) is required to head the laboratory functions having experience and qualifications in laboratory analytical instrumentation techniques and appliance testing and instrument calibration. Should also train, monitor and qualify facilities operators.

2. Need to establish and document standards laboratory operating procedures or quality control manual for each of the tests, specifying personnel, instruments, apparatus, calibration, standards, procedure and methods. An impartial auditor must be appointed to report on conformance with the provisions of this manual.

B. Administrative/Management Goals (cont'd)

3. Entry into the laboratory by outsiders should be regulated. Certification random testing must be conducted without manufacturer present by using product installation instructions and other special instructions provided with certified data.

4. Test reports of the Appliance/Fuel Testing should be confidential only to the client. Results should not be used for litigation purposes. Prior permission for publicizing test reports deemed necessary.

5. Original instruction and operating manuals of equipments to be stored in a secured place and only Xeroxed manuals are to be used in the laboratory.

6. A library containing all documentation/publications about testing procedures, etc. should be maintained.

7. The seal of approval must be affixed on every product certified.

8. The need for mutual agreement on number of samples to be tested and method of random selection of test samples.

9. The disposal of test samples within a prescribed period specified in the laboratory operating procedures.

10. Working standards should be utilized for calibration of panel mounted/field diagnostic instruments.

B. Administrative/Management Goals (cont'd)

11. Intervals of calibrations of secondary and working standards to be established (once a year).

12. The movement of personnel in the standard calibration room and appliance/fuel testing rooms should be restricted.

13. Testing and calibration services should be provided to industries on a fee basis.

14. First aid and safety kits should be provided.

15. Need to codify procedures for dealing with emergency situations.

C. Equipment and Instrument Requirements

1. Test Instruments and Equipment

a. No major test equipment involving huge financial outlay is considered necessary for acquisition in the near future.

b. In order to facilitate export of Philippine products to other countries, a 50 hz. electric supply system needs to be installed; Capacity to be 15-20 KVA.

c. Laboratory precision type wattmeters, Kilowatthour/watthour meters, ammeters, voltmeters, pressure gauges should be acquired. A list of instruments suggested is given separately in the Appendix.

C. Equipment and Instrument Requirements (cont'd)

2. Appliance Testing

a. Facilities for testing the following equipment should be established in the order of priorities indicated:

Product	Time Schedule
(1) Refrigerator Testing	1 year
(2) Lamp and Ballast Testing	1 year
(3) Gas Stove Testing	1 year
(4) Electric Hot Plate Testing	6 months
(5) Electric Fans/Blowers	6 months
(6) Water Heater Testing	1 year
(7) Flat Iron Testing	6 months

3. Room Air Conditioner Test Room

a. Room Air Conditioner test room must be upgraded further to control wet-bulb in the outdoor test room by providing control device on the refrigerating system of the chiller device.

b. All measuring instruments on the RAC test facility used as part of test results must be calibrated with a certificate attached and made available for client's inspection. Calibration must be done annually; otherwise, it will be tagged as unsuitable for use.

D. Infastructural Facilities

1. Construct extension to present second floor to add a windowless air conditioned room (dehumidified air at 68°F and 50% R.H.) and transfer the existing calibration instrument presently located in the ground floor room. The new room must be provided with air curtain and/or double door entry to prevent contamination by dust particles, etc., by use of air filter of ionic/activated carbon-type. There should be two rooms, one for the primary standards and the other room for the secondary standards.

2. Provision of anti-static flooring and anti-static electrical discharge system to be provided in the calibration rooms.

3. Ground floor space presently being occupied by the Standards Laboratory to be used for engineers office and laboratory space outside of office to be used for refrigerator testing, ballast testing and etc.

4. It will be necessary to further extend the building in order to accommodate other appliance testing modules.

5. The entire laboratory should be air conditioned to do appliance testing under controlled ambient condition and better quality windows with thermal shielding to accomplish this requirement.

6. Centralized compressed air (dehumidified and dry) and a vacuum system should be provided.

D. Infastructural Facilities (cond't)

7. Proper stand with hold down capability should be provided for compressed gas cylinder.

8. A 5-kw diesel generating set to be provided to maintain steady state electric source to the instrument calibration room.

9. Emergency showers should be provided in the Fuels Laboratory for eyes and total body protection.

10. Smoke and fire alarm system should be provided in the laboratory building.

11. Separate hot room with ventilation for testing equipment requiring open flames.

12. A good electrical grounding to be provided for laboratory electrical supply.

13. All electrical sockets should be industrial type and explosion proof in lieu of residential type presently used.

E. Training Program

1. Participate in international conferences on standard and laboratory measurement techniques by the technical personnel.

2. To be institutional members of international professional bodies.

E. Training Program (cont'd)

3. To train one of the engineers of the fuels laboratory in glass blowing techniques for maintaining and replacement of glass laboratory equipment as performed by the National Institute of Science and Technology.

4. To train one of the engineers of the electrical laboratory in digital instruments servicing institutions similar to the National Institute of Science and Technology, National Engineering Center of the University of the Philippines and Nippon Electric Corporation.

5. Engineers from Bureau of Energy Utilization going abroad on training should document their experiences in the form of a report and circulate it to other BEU engineers.

6. A library of all brochures on all instruments should be maintained in the laboratory.

7. A training program for industry personnel on laboratory measurement techniques should be conducted periodically.

8. Upgrading of the skills of laboratory operating personnel is periodically necessary by sending them for refresher courses in the relevant subjects; either in the Philippines or in developed countries.

F. Future Plans

1. Conduct training programs for local industry personnel and for people from developing countries in Fuels and Appliance Testing.

2. To develop this laboratory as a regional test facility for serving the needs of ASEAN group of nations.

3. To get recognition from international institutions located throughout the world as an accredited testing laboratory for certain specified items or equipments.

4. Expand the testing facilities in the laboratory to include certification of packaged type air conditioners, solenoid valves, control valves, circuit breakers and flame-proof testing of electrical equipment.

5. The UNIDO's Chief Technical Advisor should visit laboratories in the United States and other countries to observe new techniques and learn of up-to-date instrumentation and facilities.

6. Send Electrical Engineer to ETL Testing Laboratories, Inc. to learn calibration of instruments.

7. Send Refrigeration Engineer to ETL Testing Laboratories, Inc. to learn refrigeration testing.

8. Calibrate appliance products for Bureau Utilization Laboratory at a recognized laboratory and maintain these samples for annual calibration of BEU's test facilities.

STANDARDS FOR TESTING APPLIANCES

The following standards from ETL Testing Laboratories, Inc.'s library were hand carried to Bureau Energy Utilization Laboratory and copies were made for their library of standards:

1. ANSI/AHAM HLW-1-1980
   Performance Evaluation Procedure for Household Washers

2. ANSI Z21.5.2-1979
   American National Standard for Gas Clothes Dryers, Volume II, Type 2 Clothes Dryers

3. ANSI Z21.1-1982
   American National Standard for Household Cooking Gas Appliance

4. ANSI Z21.10.1-1984
   American National Standard for Gas Water Heaters, Volume III, Circulating Tank, Instantaneous and Large Automatic Storage Water Heaters

5. ANSI C78.3-1978
   American National Standard for the Dimensional and Electrical Characteristics of Fluorescent Lamps-Instant-Start and Cold-Cathode Types

6. ANSI C82.1-1985
   American National Standard for Ballasts for Fluorescent Lamps - Specification

7. ANSI C82.2-1984
   American National Standard for Fluorescent Lamp Ballasts - Method of Measurement

8. ANSI C78.1-1978
   American National Standard for the Dimensional and Electrical Characteristics of Fluorescent Lamps - Rapid-Start Types

STANDARDS FOR TESTING APPLIANCES (cont'd)

9. ANSI C78.2-1978
   American National Standard for the Dimensional and Electrical Characteristics of Fluorescent Lamps - Preheat Start Types

10. ANSI/AHAM HRF-1-1979
    American National Standard Household Refrigerators, Combination Refrigerators Freezers and Household Freezers

11. ASHRAE 16-1983
    Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditioners

12. ANSI/AHAM RAC-1-1982
    American National Standard for Room Air Conditioners

CONCLUSION

The Ministry of Energy, Bureau of Energy Utilization has an impressive long term project to establish the necessary services and laboratories to achieve a better energy utilization in the Philippines. The Ministry is also setting another goal to help and cooperate with industry to help in improving the quality and performance of their products so it would be acceptable in the world market.

From my observation and discussions with the Chief of Energy Conservation and the Chief Technical Advisor, the Bureau of Energy Utilization is presently making excellent progress towards the goals for energy utilization and conservation. However, to further accomplish these goals, they require additional test facilities for the measurement of energy consumptions in appliances. The Room Air Conditioner test facility and testing program presently in operation is an example of an accomplishment by the Ministry. Energy saving programs for other appliances and improvement of efficiency in the use of fuel should be pursued to the fullest and with haste.

The personnel at the Bureau of Energy Utilization should continue to participate in technical seminars and training programs in the developed industrial countries. This should keep them current with technology changes and be up-to-date on measurement techniques. These new techniques should then be passed on to their industries through seminars and discussion sessions.

CONCLUSION (cont'd)

The recommendations contained in this report will help in finalizing their goals and to become a professional type laboratory operation. Though my stay in Manila was a short seven working days, we were able to accomplish most of our objectives, thanks to the excellent cooperation from the personnel at the Bureau of Energy Utilization and the Chief Technical Advisor.

APPENDIX

List of instruments necessary to equip laboratory:

Item	No. Required
1. Orsat Apparatus	2
2. Boy's Gas Calorimeter	1
3. Non-Contact Type Torque Meter for measurement of Electric Motor HP	1
4. Frequency Integrator for Item 3 above and for other general purpose	1
5. Data Logger	2
6. Laboratory Precision Pressure Gauges	
0 to 50 psig	2
0 to 200 psig	2
0 to 500 psig	2
0 to 1500 psig	2
7. Mcleod Vacuum Gauge for Vacuum Measurement	1
8. Hot Water Flow Meter	
1/2 inch	1
3/4 inch	1
1 inch	1
9. Cold Water Flow Meter	
1/2 inch	1
3/4 inch	1
1 inch	1
10. Solid State Kilo Watt-Hour and Watt-Hour meters	4
11. Spun Aluminum Air Flow Nozzles	
1 inch diameter	1
2 inch diameter	1
3 inch diameter	2
5 inch diameter	2

APPENDIX (cont'd)

List of instruments (cont'd)

Item	No. Required
12. Laboratory-Type Analog Meters	
Voltmeter meter, 0-220 V	1
Ampmeter meter, 0-10 A	1
Kilo Watt-hour meter, 0-25 A	1
13. Pt-pt-Rh Thermocouple Assemply complete with protective sheath and compensating cable (28 AWG)	2
14. Ultrasonic Humidifiers	1
15. Variac	
1 KVA capacity	2
3 KVA capacity	1
5 KVA capacity	1
16. Weston Cell	1
17. 50 hz, 220 V, 5 KVA Electric Power Supply unit for testing appliances for export	1
18. 24 hour temperature and humidity recorder for refrigeration testing	1
19. Standard lamps and ballasts for the Lamp and Ballast Testing	1
20. Decade Resistance Box, 6 decades 1,000 OHMS to 1 micro OHMS	1
21. Digital Process Signal Calibrator	1
22. Ice Point Reference cell for thermocouple	1
23. A.C.Voltage and Current Standard (working standards)	1
24. Selector switches, 24 points for thermocouples	3

APPENDIX (cont'd)

List of instruments (cont'd)

	Item	No. Required
25.	Sliding Resistors	4 ea.
26.	Chromel-Alumel and Copper-Constantan Thermocouple wires, 26 AWG, 24 AWG, 20 AWG, 18 AWG and 16 AWG in 500 ft. per roll	1 roll ea.
27.	Compensating Cable for Thermocouples 500 ft. per roll	2 rolls
28.	Thermocouple Fusion Device (with accessories)	1 ea.
29.	Terminals for Thermocouples, 24 points ea.	6 ea.
30.	Socket (Amphenols, 24 points)	6 ea.
31.	Temperature Indicator, selectable range	1 ea.
32.	Temerature Recorder, selectable range with sealing function; 24 channels	1 ea.
33.	Smoke and Alarm System	4 ea.
34.	Shower and Eye Wash for laboratory	1
35.	Air Cleaner for the laboratory	4
36.	Air Curtain for the Standards and Calibration Room	1
37.	Fire Extingwishers (PSA approved)	3
38.	Centralized laboratory compressed Air System	1
39.	Compressed air drying system using refrigeration	1
40.	Centrifuge System to ASTM test of BS & W	1
41.	Intercom System for laboratory, 10 line exchange	1
42.	Oil Bath for Thermocouple calibration temperature control	1
43.	Air Conditioning unit to maintain 68° F drybulb, 50% relative humidity in standards and calibration rooms	1

APPENDIX (cont'd)

List of instruments (cont'd)

Item	No. Required
44. Refrigeration/Freezer for Fuel Lab use	1
45. Glassware Dryer	1