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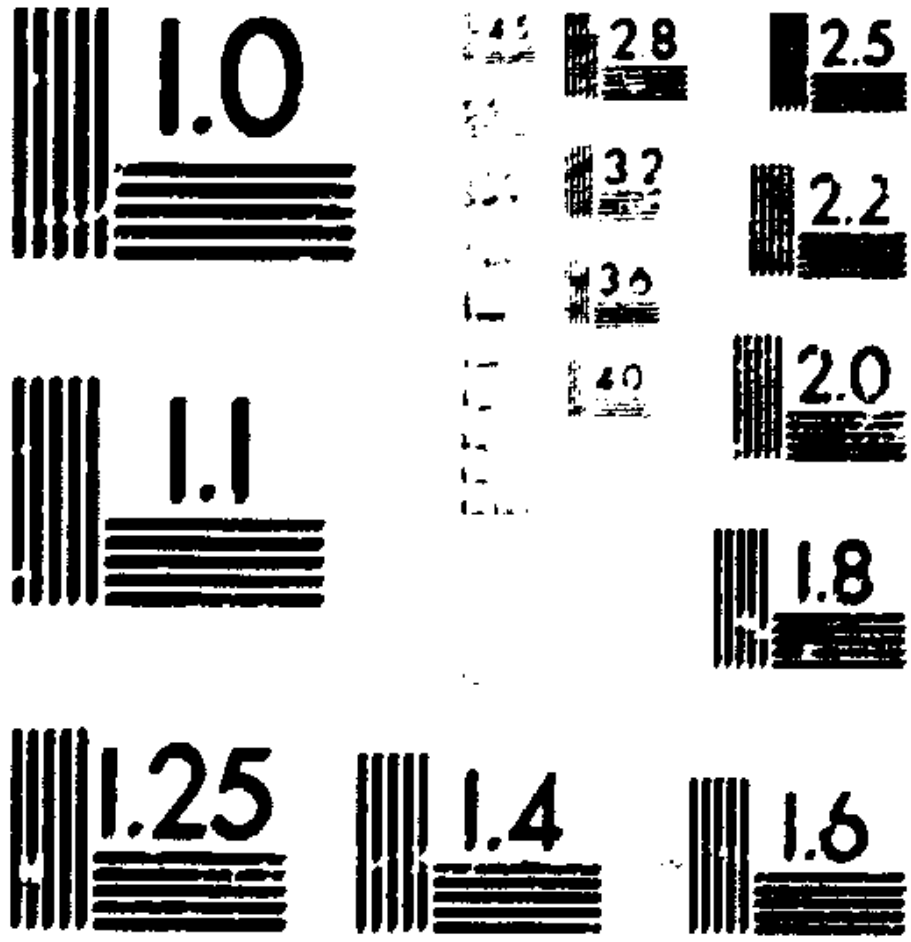

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DP/ID/SER.A/568
15 February 1985
ENGLISH

ENERGY CONSERVATION IN INDUSTRY

DP/EGY/83/001

EGYPT

Technical report: Energy Conservation in Egypt: Electronic Measurement*

Prepared for the Government of Egypt
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of I.N. Petrov,
Expert in electronic measurement

3456

United Nations Industrial Development Organization
Vienna

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V.85-22506

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EXPLANATORY NOTES

The current rate of the Egyptian pound is
1 L.E. = 1.2 US dollars.

The following abbreviations are used:

TIMS : TABBIN INSTITUTE FOR METALLURGICAL STUDIES

IECC : INDUSTRIAL ENERGY CONSERVATION CENTRE

MDDV : MOBILE DIAGNOSTIC AND DEMONSTRATION VEHICLE

ABSTRACT

This report is concerned with the establishment of an Industrial Energy Conservation Centre in Egypt, reference DP/EGY/83/001.

The project document was approved on 17.05.1983 and the project became operational in June 1984.

The UNDP contribution is US$ 400,000.

The Government contribution is LE 870,000 in kind and L.E. 145,000 in cash.

The mission covered a period of four weeks.

The main recommendations are to speed-up supply of the equipment requested, to appoint additional technical and Junior Engineering staff, lectures for the top-level company managers to be arranged and to organize in 1985 the counterpart staff training abroad.

RECOMMENDATIONS

The following recommendations are proposed for kind consideration by the National Project Management, the Government of Egypt, UNDP and UNIDO in order to facilitate the smooth project implementation:

1. UNIDO to process the Requisition Nos. 85/1, 85/2 and 85/3 in order that all the equipment, including the MDDV should be supplied by the end of April 1985.

2. The National Project Manager to organize the commissioning of the equipment received by the end of May 1985.

3. The National Project Manager to consider the appointment of 11 technical and junior engineering staff not later than the end of April 1985.

4. The National Project Manager to nominate the trainees in January 1985.
   The Ministry of Industry to issue a letter of Transmission for above trainees in February 1985.
   UNIDO Training section to organize the training in the period of March-September 1985.

5. The National Project Manager to arrange special courses for the company's top-level managers dealing with economic aspects of energy conservation and efficient use of energy during 1985 with special reference to the importance of the accurate measurement of variables, necessary for managerial evaluation.

INTRODUCTION

This report covers the results of a mission to Egypt which lasted from 29 November to 29 December 1984. During this period the expert was attached to the Industrial Energy Conservation Centre at Tabbin Institute for Metallurgical Studies. The IECC has been established with the aims of assisting public and private industries to achieve definite measures and targets for energy conservation.

The duties of the mission called for assistance on selection of required measuring and control devices, used in energy conservation techniques and practical lectures on the same subject. Lectures on the above and related topics were delivered to the staff of IECC and the participants from the local industries.

Visits were made to several sites which had energy intensive processes as well as to Electronic Industries Research and Development Centre in Cairo.

The workshop and the visits provided opportunities for formal discussions on a number of potential energy conservation projects.

The equipment supply was studied and requisitions for additional electrical energy and power measuring instruments were prepared and sent to UNDP-Cairo.

Recommendations were given on additional counterpart personnel appointments, on the training abroad and on the training lectures provided by IECC.

1. Scope of Activities

A. General

This mission in Cairo, Egypt lasted from 29th November 1984 to 29th December 1984.

During this period the expert was attached to the IECC at Tabbin Institute for Metallurgical Studies.

IECC has been established with the aims of assisting public and private industries to achieve definite measures and targets for energy conservation.

The duties of the mission (Annex 1) called for assistance on selection of required measuring and control devices, used in energy conservation techniques and practical lectures on the same subject.

According to the Job Description a detailed Work Plan was prepared (Annex 2) jointly with the National Project Personnel (Annex 3).

B. Selection of equipment

Consultations on this matter took place with National Project Management.

There were dicussions also with Mrs. M. Hetata - Programme Officer, Dr. A. Amin and Dr. H. Samir (both from TIMS) at UNDP Office on December 11, 1984.

At this meeting equipment purchase was discussed.

A new Project Budget Revision "E" was prepared, providing for equipment under B/L 49 total US$ 213,000.

The amount of US$ 146,000 is allocated for the Mobile Diagnostic and Demonstration Vehicle (MDDV) as well as for the PERQ-2 Graphics workstation (see Annex 4).

The additional equipment to be specified for the project is for US$ 67,000.

The expert is in full support of the Mobile Diagnostic and Demonstration Vehicle (MDDV) with the ancillary measuring and test equipment and support tools to be incorporated as per Annex 4.

The expert fully supports also the purchase of the PERQ-2 Graphics Workstation as per Annex 4.

For achieving of Project Output No. "e" (Page 3 of the Project document) the purchase of sophisticated equipment (not included in the MDDV unit) for measurement of electrical power and energy is recommended.

After thorough study of the Project objectives, the equipment already purchased or in progress to be purchased, after inventory of the equipment available at TIMS, after discussions with the National Project Personnel, the expert prepared Requisitions for this additional equipment for measurement of electrical power and energy for a total US$ 30,000.

The numbers of the Requisitions are sequenced for 1985, partly because no information exists at TIMS or at UNDP-Cairo on the Requisitions issued till now, and partly because these Requisitions will reach UNIDO and will be processed during 1985 only (Annex 5).

It should be pointed out, that the MDDV purchase is not yet completely finalized. After the procurement of the MDDV is realised, final decisions could be taken for complementary measuring equipment to be purchased, if necessary.

C. Training Lectures

Two lectures were delivered to the staff of IECC and to engineers from the local industries. These lectures were entitled:

- Process control system based on Microprocessor Programmable Controllers.

- Economic aspects of Energy Measurement.

The theme of the lectures was to set out a systematic approach to process control instrumentation and more comprehensive and accurate measurement in order to establish sophisticated and flexible energy management. The lectures were practically oriented and the state-of-the-art was presented.

A complete volume of the publications of the 4th International Conference on ENERGY OPTIONS (3 - 6 April 1984) was given to IECC library for reference and use.

D. Training Programmes

The centre at TIMS already organises energy conservation workshops for local industries. The Programme was discussed. The expert advice was to arrange special courses for the company's top-level managers in order to explain practically the economic aspects of the energy savings for the company itself, as well as for the country's economy as a whole. Special attention should be drawn to the potential oil export opportunities (by means of energy savings) in the light of the international oil prices, which are much higher than the prices inside the country.

As far as the energy conservation activities required certain managerial, organizational and financial efforts, the energy conservation education of the company's top-level managers is of vital importance.

E. Training abroad

The training abroad of the project personnel was discussed with the National project management. The case was raised also by the various managers during the site visits. In particular training was requested,

- On process control systems based on microprocessor programmable controllers at the Institute for Instrument Design in Sofia.

- On robotics (by Iron and Steel Co.,) at the Institute for Robctics in Sofia.

The expert advice was, to prepare the corresponding Fellowhsip or Study Tour Nomination Forms for each trainee, taking into account the training abroad to be provided in the frame of MDDV purchase and to send as soon as possible these Nomination Forms to UNIDO Training Section for arrangements.

The training at the above-mentioned Institutes in Sofia is likely to be accepted without objections in view that both the institutes have UNDP/UNIDO projects.

F. Counterpart Personnel

The capacity of counterpart personnel was discussed several times with Prof. Dr. Selim, Dr. Amin, Dr. Samir, Mr. T. Sabry and partly with Mrs. M. Hetata. During the discussions the following findings could be recognised.

The core staff is highly educated and experienced in the field of metallurgy, but because the Project Objectives are directed to other industries also (power industry, agriculture, food processing, textile, petro-chemical industry, etc.) it is necessary for IECC to gain experience of a wider range of industrial sectors and/or to affiliate and co-operate closely with such specialists from various industries in the future. On the other hand, no technical and junior engineering personnel is appointed at the Centre capable of carrying out practical measurement and laboratory evaluation work using various measuring, test and calibration, electronics, electrical and analytic instruments for energy consumption study. In this respect, the appointment of technical and engineering personnel according to Annex 6 is of major importance. This personnel should be considered also when the fellowships and Study Tour Programmes are elaborated.

G. Site Visits

1. The Glass Factory at Mostorod, Caliopea.

Met: Eng. ZIND (Factory Manager)

Mr. A. TAUFIK (General Manager, Electronic Department)

This factory produces bottles for soft drinks and pharmaceutical industries.

Three production lines are in operation.

The process control instrumentation (classical separate instruments) are supplied by Siemens (for one line) and Honywell (for two lines).

A UNDP Project (Revolving Fund) is under consideration to modernize the furnace No. 3 in order to increase the productivity from 100 tons/day to 300 tones/day and to cut down the consumption from 2,23Kwh/Kg glass to 1.4 Kwh/Kg glass.

The pay-back period is estimated around 6 months.

The general supplier for the reconstruction will be SORG Co. -FRG.

The modernization of the two other furnaces is also under consideration.

In this respect the expert advice was to supply the new third production line with modern micro-processor process control instrumentation in order to:

- increase reliability and flexibility.
- drastically reduce the control room space.
- build-in the infrastructure for future total Distributed Control System.

The factory does not have built-in electrical energy measuring instruments and pays the price, claimed by the supplier.

The expert advice was to install high accuracy electronic kilowatt-hour meters in order to start managerial activities for energy consumption analyses.

2. The Delta Steel Mill

Met: Mr. N. ABOUSBAH - Technical Director

This Company has several electric arc furnaces , using scrap steel as feed material. The final product of the company is mainly construction steel for the local market. The process

control and electrical energy measuring instrumentation is a very classical one. The measuring accuracy of the built-in kilowatt-hour meters is stated 2%, but no calibration was made up to now.

The Company is a very large electrical energy consumer - 50MW (Megawatts) installed power and is working 24 hours.

A modernization of the mill,(purchased second-hand in 1947 from Italy) is planned.

A DEC computer, type PDP-11 is purchased and the corresponding software packages are under preparation.

The expert advice was to consider the scheme of building Data Aquisition System, based on the PDP-11 Computer (already purchased) and electronic high accuracy energy meters in order to measure, evaluate and manage the electrical energy consumption on the different production lines and critical points.

The expert advised also, in the frame of the negotiations with the suppliers for modernization to require quotations for the process control instrumentation: the ordinary and the micro-processor based.

After receiving these quotations, jointly with specialists from IECC-TIMS to make energy conservation evaluations and to take the final decisions.

3. Egyptian Iron and Steel Co.

Met: Mr. FIKRY ABO. AREF - Director, Production Planning and Energy Control

Mr. YOUSSEF ABDELGAWAD - Chief of Flectrical Power Department

This is a large industrial complex, consisting of an integrated iron and steel process.

Mr. Aref explained the quality problems encountered because of lack of Infrared Gas Analyser for Co and CO_2. The problem is well known to the specialists of TIMS (particularly to Dr. Samir). Taking into account that such Gas Analyser is under purchase in the frame of MDDV (Annex 4) the expert advice is as follows:

After the MDDV is commissioned, the IECC staff to carry out measuring and evaluation activities and to prepare well justified recommendations for the actions to be taken, in order to improve the quality of the final product.

The expected savings are around LE 3 millions.

Mr. Abdelgawad asked for arrangement of visits to the Institute for Robotics in Sofia, in connection with large modernization activities planned at Iron and Steel Co.

The expert advice was, in the frame of the project (DP/EGY/83/001) to prepare the corresponding Nomination Forms for processing by UNIDO Training Branch.

4. Electronic Industries Research and Development Centre (EIRDC)

Met: Dr. Rojdi Hadidi

The Centre received a long time ago UNDP/UNIDO assistance in strengthening the Training, R + D, and Service Activities for local industries, being supplied with large scale of electronic measuring equipment.

The Centre is looking for practical conditions in the field of measuring and process control instrumentation. At the same time TIMS does not yet have Technical and Junior Engineering Staff in the field of electronics.

From this point of view, the expert advice was for the Management of both IECC-TIMS and EIRDC to study the opportunities for co-operation in the frame of electric measurement for energy conservation activities.

5. Egyptian Copper Works, Alexandria

Met: Mr. MOHAMAD A. METAWALLY - Director, Engineering Sector

Mr. AHMED M. EL-BENDAK - Metallurgist

Mr. ABDUL ALIM GANEM - Engineering Rolling Shop

This Metallurgical Complex is divided into three sections: steel, copper, aluminium.

Some of the equipment was installed 45 years ago, some (like aluminium continuous casting) are completely new. The measurement and process control instrumentation also vary according to the age of the equipment. On the aluminium continuous casting line, the instrumentation is a modern one and in good condition, and on other production lines it is very old, inaccurate, even out of operation, and the processes are controlled by the operators relying on their experience. Certain difficulties exist with the spare parts. The process control and measurement instrumentation department has not enough testing, and calibration and service instruments.

After the visit a meeting was arranged with Mr. M. Metwally.

The expert advice was as follows:

a) on 25 ton Electric Arc Steel Furnace:

- To ask the original supplier for assistance on solving the problem with the movement of the electrodes.

- If this is impossible, to start detailed trouble-shooting studies (the procedure was drawn to the attention of the local specialists by the expert) procedures during the monthly maintenance stoppage of the furnace, using the test instruments required.

- If the test equipment required is not available, to ask TIMS for assistance, after the MDDV is supplied for joint trouble-shooting and evaluation study.

b) On 50 ton Open Hearth Furnace:

- To replace or to repair all the measuring instruments in order to provide for the operator a real information for the process variables. Without such information the operator is not able to carry out the right process control manipulations.

- As a second step to introduce a simple process mechanization and automation in order to avoid human errors and/or instability.

c) On 1600 ton Horizontal Extrusion Press:

- In order to reduce the manpower to introduce a programmable controller for all the functions. Such reliable controllers are available on the market (Festo-Austria, Allen Bradley-USA, Texas Instruments-USA, Izotimpex-Bulgaria).

  By introducing such a controller the number of the operators working in heavy environment could be reduced from 15 to 2 per one shift.

d) On Department for Maintenance and Calibration of Instrumentation:

- To supply the Department with a set of testing and calibration and trouble-shooting equipment (a recommended list will be prepared by the expert and will be sent before 15 January 1985).

- To use the capability of the UNDP assisted project in Electronic Industries Research and Development Centre, Cairo for repair, testing and calibration of the instrumentation, which is now out of operation.

e) On Automation:

- To appoint an experienced engineer on process automation whose duty will be to study every process and to recommend and initiate specific projects for mechanization and automation, which could be realized by the plant itself.

11 Conclusions

The IECC objectives are directed to assist the Egyptian industries in the efficient use of energy. This mission is concerned with the assistance on selection of the required measuring and process control instrumentation used in energy conservation techniques and related problems like training, evaluation and maintenance by means of measurement.

The energy saving and energy conservation activity requires the measurement of process variables, the same variables must be controlled. In some of the factories visited a lack of measurement was evident and the overall energy evaluation is based on practical experience and feeling based on long years of experience.

Therefore the expert strongly supports the proposal for Mobile Diagnostic and Demonstration Vehicle equipped with wide range measuring instruments. By such a unit a determination of the efficiency of energy intensive processes could be carried out and on this basis conclusions and recommendations for improvement could be elaborated. Based on these recommendations the corresponding technical, managerial and/or financial actions should be initiated, including installation of permanent measuring and process control devices.

In addition, the recommended electrical energy and power measurement instruments should be purchased in order to complement the devices incorporated in the MDDV.

The energy conservation workshop organized by IECC will play an important role on enlightening the major problems on efficient energy utilization. But is it advisable to arrange special courses for the company's top-level managers in order to explain practically the economic aspects of energy savings for every specific company, as well as for the whole country's economy. The top-level manager involvement and support is of vital importance for the practical actions in industry and for the country's development objectives.

The training abroad should be concentrated on the following major fields:

- Study the state-of-the-art on efficient energy use for specific products in various industries (metallurgy, chemical industry, food-processing, agriculture, textile, housing, construction materials).

- Operation, maintenance and service of MDDV.

- Modern microprocessor measurement and process control techniques and instrumentation.

Additional technical and engineering counterpart personnel is likely to be appointed in order to provide qualified operational, on-site and laboratory measurement, evaluation and practical work.

The details are outlined in Annex 6. The close linkage and co-operation with the responsible officers for energy saving in various industries initiated already by TIMS-IECC should be widely suppoeted and strengthened in the future.

In the frame of this close linkage and co-operation a transition from the subject to objective measurement of all variables should be established as a base for effective energy use evaluation.

As far as the second mission of the expert in electronic measurement is concerned, this mission should take place only after all equipment is procured, and the counterpart personnel is already trained abroad.

During this second mission a specific survey activity should be carried out together with the counterpart staff at specific industrial processes.

ANNEX I

6 June 1984 25 May 1984

PROJECT IN THE ARAB REPUBLIC OF EGYPT

JOB DESCRIPTION
DP/EGY/83/001/11-01/31.9.C

INTERNAL

Post title	Expert in Electronic Measurements
Duration	One month
Date required	November 1984
Duty station	Cairo
Purpose of project	To assist in the establishment of a training and maintenance system for electronic measuring and control devices and equipment, forming part of the Industrial Energy Conservation Centre (IECC).

Duties

The expert will be attached to the IECC and will specifically be required to:

1. Assist the IECC staff in selecting required measuring and control devices, used in energy conservation techniques;

2. Conduct training and maintenance courses in electronic measurement and control techniques and the devices used for this purpose;

3. Assist a group of IECC specialists in development work concerned with automation technology;

4. Assist a group of IECC specialists in evaluating new projects dealing with energy conservation.

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

.../..

Qualifications

Qualified electronics or electrical engineer with extensive knowledge of electronic measurements and control techniques. Experience in conducting seminars and training courses, an asset.

Language

English

Background information

Research and development undertaken within the past decade in various countries has generated many technological and non-technological means, for conserving energy and for using it more efficiently, as well as for deriving substitutes for oil through other renewable sources of energy, particularly useful to industry.

This point is of great importance to the country, where domestic consumption of oil-based energy amounts to some 75% of the entire energy obtained from local oil production, thus depriving the country's economy of valuable foreign exchange earnings. To counteract this situation, the government, in conjunction with the management of industrial enterprises and supported business leaders, has decided to take action in order to achieve a reduction in domestic oil consumption without affecting the end-user demand for energy.

The objectives of the country's Development Plan up to and including the year 2000, are to accelerate industrial development so that national income is increased and employment opportunities are constantly created for a steadily growing population. The present structure of the industrial sector in the country includes 117 public and approximately 70 private-sector companies varying in size from medium to large.

The government's development plan for the six-year period 1982 - 1987, has given priority to the development of heavy mechanical industries as well as to the electrical, electronic, petro-chemical, textile, mining, chemical and food industries, all of which are energy-intensive undertakings.

At present, studies and collected data indicate that in all these industries a considerable amount of the energy supplied is not utilised and is thus lost and wasted, in some cases reaching up to 40% of the energy input. One of the IECC's top priorities is, therefore, to combat this situation without effecting production outputs and living standards and without incurring capital and labour costs in excess of that of the value of the energy saved.

In particular, sectors such as the iron and steel industry require considerable attention on account of the fact that these industries alone consume up to 12% of the energy consumed by the country as a whole. The IECC can most certainly play an important role in streamlining this operation and thus in achieving energy savings of considerable magnitude.

In the same way, chemical and metallurgical undertakings as well as refractories and the cement industry are also considerable users of energy and, as such, are considered priority areas for action by IECC.

In this capacity, IECC will be involved in investigating the merits of alternative sources of energy (ie. nuclear energy) and those of renewable sources of energy (solar, wind, tide) for application in specialized areas. In addition, hydro-electric power generation will also be considered for utilisation in small to medium-scale applications.

The objectives to be achieved by implementing this project can be summarized as follows:

a) To establish the IECC as a permanent and independent institution in the country;

b) To create a core of trained specialists at the IECC to carry out on-going activities in energy conservation in the country;

c) To create a number of trained specialists to act as advisors on energy conservation in all industrial and commercial sectors in the country;

d) To provide programmes and methodologies of training (including diagnostic and remedial aspects) concerning identification of energy saving measures;

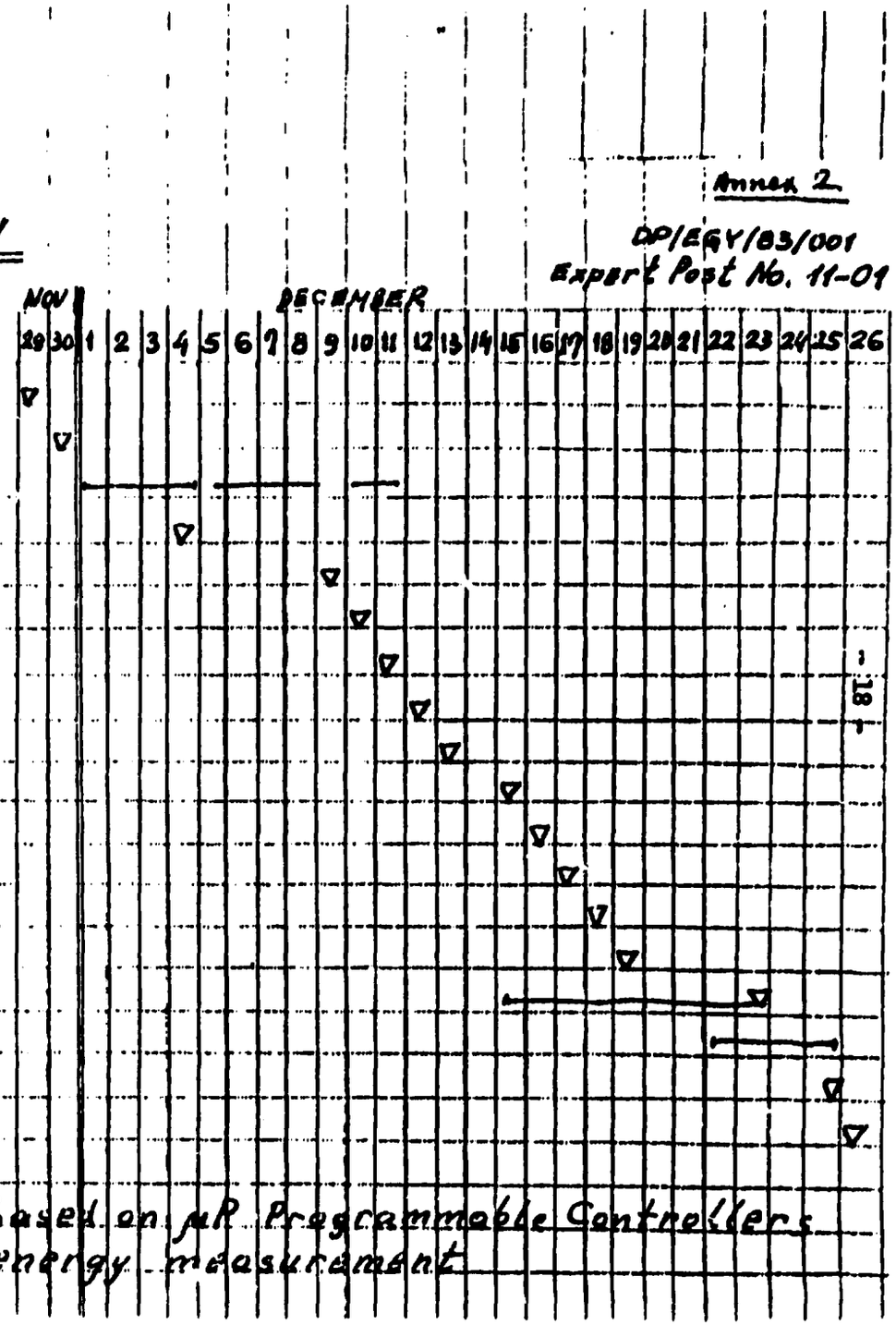
e) To establish a research and testing facility for the purpose of assessing and evaluating energy saving technologies and their applications.

These objectives will not only be instrumental in demonstrating the opportunities and the desirability of energy conservation to authorities in industrial and commercial organizations, but will also provide the means for putting these ideas into practice.

Annex 2.

DP/EGY/83/001
Expert Post No. 11-01

WORK PLAN



Note:

1st Lecture: Process Control System based on µP Programmable Controllers

2nd Lecture: Economical aspects of energy measurement

Annex 3

List of IECC senior Counterpart Staff

1. Prof. Dr. M.H. Selim,	Rector of TIMS, National Project Manager Professor of Metallurgy
2. Prof. Dr. Saied E. Khalil,	Vice Rector of TIMS
3. Dr. A. Amin	Executive Manager of I.E.C.C.
4. Dr. S.H. Hosam El-Din,	Chief, Automation Department
5. Dr. N. Helmy,	Mechanical Department

ANNEX 4

4 July, 1984

Dear Mona,

SUBJECT: DP/EGY/83/001 - Mobile Diagnostic and Demonstration Vehicle (MDDV)

Following a request made by Chairman eng. dia. Tantawi, who, I presume, is attached to the Tabbin Institute, I am sending you herewith a copy of the tentative equipment list for the MDDV.

The items mentioned in this list were collated as a result of a thorough investigation into their specific involvement in tests and evaluations of performance of energy-generating and usage-facilities.

While this list is not exhaustive it nevertheless provides a good cross-section of what is required to derive meaningful results of energy efficiency tests planned for the industrial sector in Egypt.

I would be grateful if you would provide Mr. Tantawi with a copy of this list and also send a copy to Dr. Selim at the Tabbin Institute.

However, I should point out that we are presently in the process of obtaining figures for all the items concerned and therefore, the final list can only be settled after all this pricing data has been received. It could therefore be possible that some of the listed equipment items will have to be deleted to stay within the total budget allocation of $187,100.-

Also, I should remind you that the total complement of equipment includes one item which is to be installed at the Tabbin Institute. This item is a PERQ 2 Graphics Workstation (i.e. data processor with 1Mb RAM; display controller; I/O channel controller; 35Mb fixed disc unit, floppy disc drive; GPIB and RS 232 interfaces; LAN controller;

.../2

Ms. M. Hetata,
Programme Officer,
UNDP Office,
29 Sh. Dr. Tana Hussein,
Zamalek,
Cairo,
Egypt

graphics display; keyboard; graphics tablet; pointing device), which item is intended for use at the Tabbin Institute to evaluate results of the tests and measurements made in the field.

I trust that the above information will be useful to you and to our counterparts at the Tabbin Institute. I will continue to send you more information as it comes to hand.

With best regards to you and Mr. Sabry.

Sincerely yours,

E. Krajenbrink
Senior Industrial Development Officer
Engineering Industries Section/DIO

Items of test equipment to be considered for inclusion in the mobile diagnostic and demonstration vehicle

1 Combustion Analyser:

for measuring
CO - in gas-fired boilers
O_2
temperature - within flue
CO_2
Smoke density
Combustion efficiency of:
- Natural gas
- Light oil
- Heavy oil
- Solid fuel

2 Digital Thermometers:

(a) temp. measurements
range:- 30° to + 450°C
accuracy: 0.7% ± 1°C
resolution: 1°C
capability to measure heatloss between 2 points

(b) temp. measurements
range: - 200°C to ± 1800°C
accuracy: 0.3%
resolution: 0.1°C (- 200°C to + 200°C)
1°C (+ 200°C to + 1800°C)

3 Probes for digital thermometer:

(a) standard surface probe:	Max temp.	+ 850°C
(b) heavy duty surface probe:	" "	+ 650°C
(c) standard probe for liquids:	" "	+ 250°C
(d) heavy duty probe for liquids:	" "	+ 850°C
(e) high temp. air/liquid probe:	" "	+ 1100°C
(f) high temp. semi-flexible air/liquid probe:	" "	+ 1100°C

4 Infra-red Thermometer

(a) temperature measurements:

- display: digital
- range: + 600°C to approx + 2000°C
- resolution: 1°C
- spectral response: 2 to 2.5 meters

(b) temperature measurements:

- display: digital
- range: 0°C to + 800°C
- resolution: 1°C
- spectral response: 8 to 14 meters

5 Humidity meter

- display: digital
- ranges: (a) 0% to 97% RH
  (b) 0°C to 70°C
- accuracies: (a) ± 2% RH
  (b) ± 1°C

6 Tachometer:

- display: digital
- ranges: (a) 100 to 1800 rpm
  (b) 1600 to approx 20,000 rpm
- accuracies: (a) ± 1 rpm
  (b) ± 10 rpm

7 pH - meter

- display: digital
- range: 0 to 14 pH
- resolution: 0.01 pH
- accuracy: ± 0.02 pH to ± 0.08 pH

8 Electric power meter

type:	clip-on
model:	portable
display:	digital
measurement:	power in Watt or K Watt
ranges:	(a) 10 Watt to 20 K Watt (b) 100 Watt to 200 K Watt
input voltage:	low range: 90 to 280 V AC high range 280 to 500 V AC
input current:	low range: up to 1 A. AC high range: up to 1000 A. AC

accuracy of power reading: ± 2% of reading ± 1 digit

9 Multimeter

type:	clip-on
model:	portable
display:	analog
measurements:	voltage; current; resistance; consultation
ranges:	(a) voltage: 0 to 1250 Volt AC (b) current: 0 to 1250 Amp AC (c) resistance: 1 to infinity ohms
accuracy:	± 3% FSD

10. Power Factor meter

type:	clip-on
model:	portable
display:	analog
measurement:	power factor (leading or lagging) in single phase; split phase; 3-phase (balanced or unbalanced) and 4 wire, 3 phase systems.
power factor range:	0 to 1.00
voltage range:	100 to 600 V. AC
current range:	3 to 500 A. AC
accuracy:	± 3% FSD

11 Manometer

type:	inclined (swivelling limb)
model:	portable
display:	analog
measurements:	pressure; velocity (gas flow on-site)
ranges:	pressure 0 - 125/250/500/2500 (N/m^2): short limb 0 - 500/1000/5000 (N/m^2): long limb velocity 0 - 14/28 (m/sec): short limb 0 - 90 (m/sec): long limb
accuracy:	short limb: ± 0.5% long limb: ± 0.3%

12 Anemometer

(a)

type:	wide range
model:	portable
display:	analog
measurement:	air velocity
range:	dual scaled: 0 to 30 m/sec and 0 to 6000 ft/min
accuracy:	below 1 m/sec: ± 0.05 m/sec above 1 m/sec: ± 5%

(b)

type:	wide range
model:	portable
display:	analog
measurement:	air velocity
range:	dual scaled: 0 to 15 m/sec and 0 to 3000 ft/min
accuracy:	below 1m/sec: ± 0.05 m/sec. above 1m/sec: ± 5%

13 Anemometer

type:	narrow range
model:	portable
display:	analog
measurement:	air velocity
range:	0.25 - 5.0 m/sec
accuracy:	± 5% of reading

14 Memory Data logger

type:	
model:	portable
display:	digital
inputs:	voltage; current; temperature; humidity; pressure; flow; pH; idssolved O_2; power consumption; gas consumption; etc.
range of inputs:	dependent on sensors
accuracy of inputs:	same as sensors ± 1 bit
computer transfer format:	8 bit parallel on baud rate from 300 to 4800

15 Chart recorder

intermittent recorder: with facility for continuous recording:	
No. of channels:	9 channels covering inputs such as voltage; current; temperature; humidity; pressure; flow; power consumption; etc.
interval between recordings:	either 15,30 or 60 minutes

16 Measurement and Control Processor

With 6 built-in I/O slots for direct connections to thermo couples and other types of sensors and actuators: Capacity 128 kB RAM. Accessories included: single floppy disk and B/W graphics unit.

The following instruments are included in this list although their specifications have not yet been settled:

17 Draft Indicator

18 Sling Psychrometer

19 Whirling hygrometer

20 Hygrothermograph

21 Milivolt chart recorders

22 Lux meter

23 Digital Multimeter

24 Microamp meter

25 Kwh meters (3 phase and 2 phase units)

26 Methane detector

27 Oxygen detector

28 Multigas detector

29 True-spot smoke tester

30 Stack gas temperature indicator

31 Surface-touch and suction-pyrometers

32 Conductivity monitor (for boiler feedwater)

33 Temperature indicator (from 0 - 1300°C)

34 Potentiometers

35 Temperature recorder

36 Photo tachometer

37 Sound level meter

38 Steam-trap Tester

39 Condensate pump counter

40 Portable digital calculators

41 16 mm film projector with internal sound amplifier. (ie. Bell and Howell model 2592)

42 Demountable projector stand

43 Selfstanding film screen, matt-white size 8 x 6 ft.

44 (One pair of) external loudspeakers of 30W power rating

45 Microphone and stand

46 16 mm film rewinder

47 16 mm film splicer

48 Video recorder PAL/SECAM VHS - System

49 Video monitor to suit video recorder

50 Video camera to suit video recorder

51 Slide projector

52 Overhead projector

In addition to the items of test equipment to be carried by the M.D.D.V., the following items of service equipment will also be included.

53 Electric drill

54 Mechanics Tool Box

55 Box spanner set

56 Gasket chisel set

57 Lever gasket chisel set

58 Parallel vise 125 mm

59 Pipe vise 2"

60 Twist drill set 3 - 13 mm

61 Tap drill set 3 - 16 mm

62 Screw cutting set 3 - 16 mm

63 Ratchet pipe cutter 1/4" - 1" and 1/2" - 2"

64 Hand hacksaw and spare blades

65 Set of hand files

66 Set of needle files

67 Set of hand pliers

68 Spring rule 3m and 10m

69 Calipers

70 Electric soldering iron

71 Extension cables

72 Set of fork and ring spanners

73 Inspection lamp (240V and 12 Volt)

74 Vacuum cleaner

75 Set of screwdrivers

76 Set of hammers

77 Set of cold chisels

Details of the vehicle

The vehicle will be equipped with a power generator unit to provide 220/240 Volt AC with a power rating of about 6 kVA.

The cabin in which all equipment will be kept or mounted, will be temperature controlled to 20°C ± 1°C, with the air conditioning unit being operated either from the self contained power generating unit, or from the mains supply.

The vehicle will be a van carrying a lockable rear cabin of some 20 m^3 capacity.

The interior of this cabin will be outfitted with racks to mount undetachable instruments as well as with cupboards to store removable items of equipment.

All racks and cupboards will be mounted on sensitive shock absorbers.

Annex 5

Copy of letter from Tabbin Institute
to UNDP.

Date: 24/12/1984

Ref. No. Requisitions DP/EGY/83/001

Dear Mr. Cappelletti,

I enclose with this letter 3 Requisitions for equipment for total US$ 30,000 resp. Req. Nos. 85/1, 85/2 and 85/3.

We corsider this equipment, (suggested by Dr. I. Petrov, Expert on electronic measurement) as vital for energy consumption evaluation laboratory in the frame of the above mentioned project. Detailed specifications are attached for each instrument requested in order to facilitate UNIDO Purchase and Contract Services Section.

Your efforts for conveying these requisitions to UNIDO Purchase and Contract Services Section will be highly appreciated.

Thanking you for your kind co-operation,

I remain,

Sincerely yours,

Prof. Dr. M.H. Selim
(National Project Manager)

Mr. Lucianc Cappelletti,
Resident Co-ordinator,
UNDP
29, Sh. Dr. Taha Ussein (ex. Willcocks)
Zamalek, Cairo
P.O. Box 982

UNIDO

REQUISITION FOR EQUIPMENT/SUPPLIES/PUBLICATIONS OR CONTRACTUAL SERVICE (IOD/PAC)

PAGE 1 OF 1

REQUISITION NUMBER 85/1

Activity Code

MISPI No.

Date 8/12/1984

LOCAL PURCHASE REQUESTED ☐

HEADQUARTERS PURCHASE ☒

Energy Conservation in Industry
Title of Project

Prof. Dr. M. H. Selim M.H. Selim
Project Manager/Requesting Officer

Project Number DP/EGY/83/001

Sub-Contracts ☐ 21- ☐☐

Expendable Equipment ☐ 41- 0 1

Non-Expendable Equipment ☒ 42- 0 1

Premises ☐ 43- 0 1

Check appropriate box

CLEARED (SUBST. OFFICE): _____ Name _____ Section _____ Date

CERTIFIED (FMIS): _____ Name _____ Section _____ Date

IOD/PAC: _____ Received _____ Returned

Item	Quantity	Unit	Description, Specifications, Catalogue Number, Reference to Project Document Component	Est. cost in US dollars
			Power Measuring Instruments in following confi-	
			guration:	
1	1	Pcs	Digital AC Meter, type 2504 with module 2514-07	
			and module 2514-16	
2	1	Pcs	Digital AC Meter type 25o5, code 25o534	
			(250531 and 251447)	
3	1	Pcs	Integrator Module, type 2513 for combining with	
			2504 and 2505	
4	1	Pcs	Digital Power Factor Meter type 2524	
			Power supply voltage : 230/50 Hz.	
			Supplier : Yokogawa Electric Works.	
			Shinjuku Center Bldg (50 F) 1-25-1 Nishi Shinjuku	
			Shinjuku-ku, Tokyo 160, Japan.	
			Phone : 03-349-0611: Telex: J 27584 YEWTOK	
			TOTAL	20,000

SPECIAL INSTRUCTIONS:

Manuals in English 2 sets

Ship Via Surface / Air To: Resident Representative of United Nations Development Programme

For: _____

Target Date: _____

Original: IOD/PAC

To be sent to Chief, IOD/PAC, UNIDO – P.O. Box 300, A-1400 Vienna, Austria

UNIDO

REQUISITION FOR EQUIPMENT/SUPPLIES/PUBLICATIONS OR CONTRACTUAL SERVICE (IOD/PAC)

PAGE 1 OF 1

REQUISITION NUMBER 85/2

Activity Code

MISPI No.

Date 8/12/1984

LOCAL PURCHASE REQUESTED ☐

HEADQUARTERS PURCHASE ☒

Energy Conservation in Industry
Title of Project

Prof. Dr. M. H. Selim. M.H. Selim
Project Manager/Requesting Officer

Project Number DP/EGY/83/001

Sub-Contracts ☐ 21-☐☐

Expendable Equipment ☐ 41- 0 1

Non-Expendable Equipment ☒ 42- 0 1

Premises ☐ 43- 0 1

Check appropriate box

CLEARED (SUBST. OFFICE): _____ Name _____ Section _____ Date

CERTIFIED (FMSE): _____ Name _____ Section _____ Date

IOD/PAC: _____ Received _____ Returned

Item	Quantity	Unit	Description, Specifications, Catalogue Number, Reference to Project Document Component	Est. cost in US dollars
1	1	Pcs	Precision Watt-meter and Watt-hour-meter Cali-	
			brator, Type 811 A	
			Power supply voltage 230 V/50Hz	
			Supplier : Rotek Instruments Corp, USA	
			TOTAL	4,000

SPECIAL INSTRUCTIONS:

Manuals in Englis 2 sets

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Target Date: _____

Original: IOD/PAC

To be sent to Chief, IOD/PAC, UNIDO – P.O. Box 300, A-1400 Vienna, Austria

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REQUISITION FOR EQUIPMENT/SUPPLIES/PUBLICATIONS OR CONTRACTUAL SERVICE (IOD/PAC)

PAGE 1 OF 1

REQUISITION NUMBER 85/3

Activity Code

MISPI No.

Date 8/12/1984

LOCAL PURCHASE REQUESTED ☐

HEADQUARTERS PURCHASE ☒

Energy Conservation in Industry
Title of Project

Prof. Dr. M. H. Selim M.H.Selim
Project Manager/Requesting Officer

Project Number DP/EGY/83/001

Sub-Contracts ☐ 21-

Expendable Equipment ☐ 41- 0 1

Non-Expendable Equipment ☒ 42- 0 1

Premises ☐ 43- 0 1

Check appropriate box

CLEARED (BUDGET OFFICE): _____ Name _____ Section _____ Date

CERTIFIED FUNDS: _____ Name _____ Section _____ Date

IOD/PAC: _____ Received _____ Returned

Item	Quantity	Unit	Description, Specifications, Catalogue Number, Reference to Project Document Component	Est. cost in US dollars
1	5	Pcs	Electronic Precision Three-phase	
			Bidirectional Watt-hour Meter, type 1AP 00i	
			with pulse output for teleprocessing	
			Power supply voltage : 230 V/50 Hz.	
			Supplier : FTO ISOTIMPEX	
			Sotia, 51 Chapaev Str.	
			Phone: 74-61-51	
			Telex: 022731	
			TOTAL	6000

SPECIAL INSTRUCTIONS.

Manuals in English 4 sets

Ship Via Surface / Air To: Resident Representative of United Nations Development Programme.

For: _____

Target Date: _____

Original: IOD/PAC

Form/IOD.12/Rev.1 (4.80)

To be sent to Chief, IOD/PAC, UNIDO – P.O. Box 300, A-1400 Vienna, Austria

Annex 6

List of Counterpart technical and junior engineering personnel to be appointed at IECC.

1.	Technician on fine mechanics with approximately 5 years experience.	1 person
2.	Technician on general electronics with approximately 8 years experience.	2 persons
3.	Technician on power electronics with 3 years experience.	1 person
4.	University graduate with 2 years experience measuring electronics	3 persons
5.	University graduate with 5 years experience in computer technic hard-ware.	1 person
6.	University graduate with 2 years experience in computer soft-ware.	2 persons
7.	University graduate with 4-3 years experience in microprocessor instrumentation.	

Important Note:

The senior engineering staff experienced in various fields of industry is not listed here, but is discussed in the report under subchapter F.