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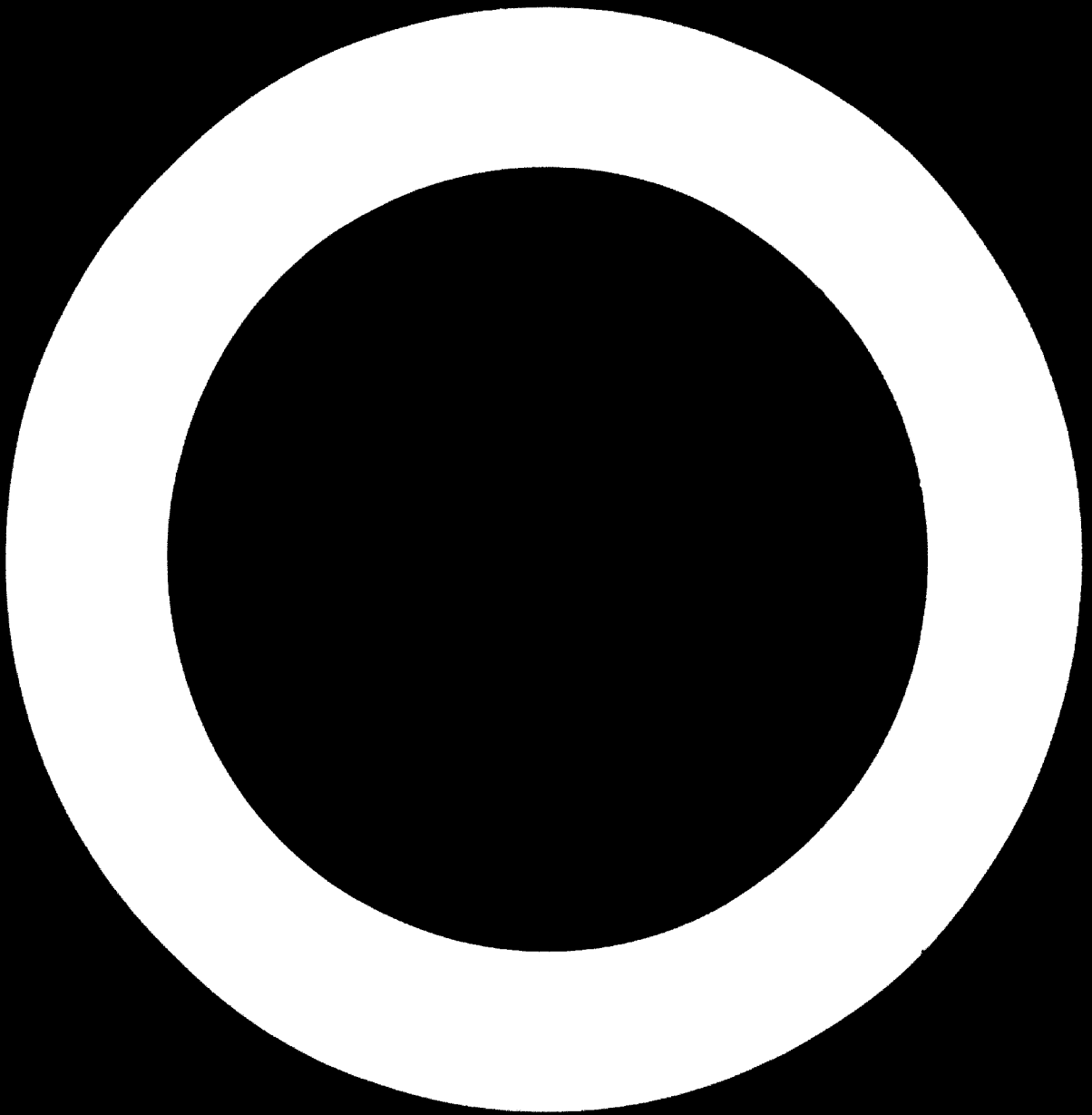
**UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION**

**REPORT OF TECHNICAL ASSISTANTS
FOR DEVELOPMENT OF THE PLANNING AND
ECONOMIC
(under EIT 21/2) AND ECONOMIC**

15 May - 1 June 1977

The views and opinions
and do not necessarily

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by

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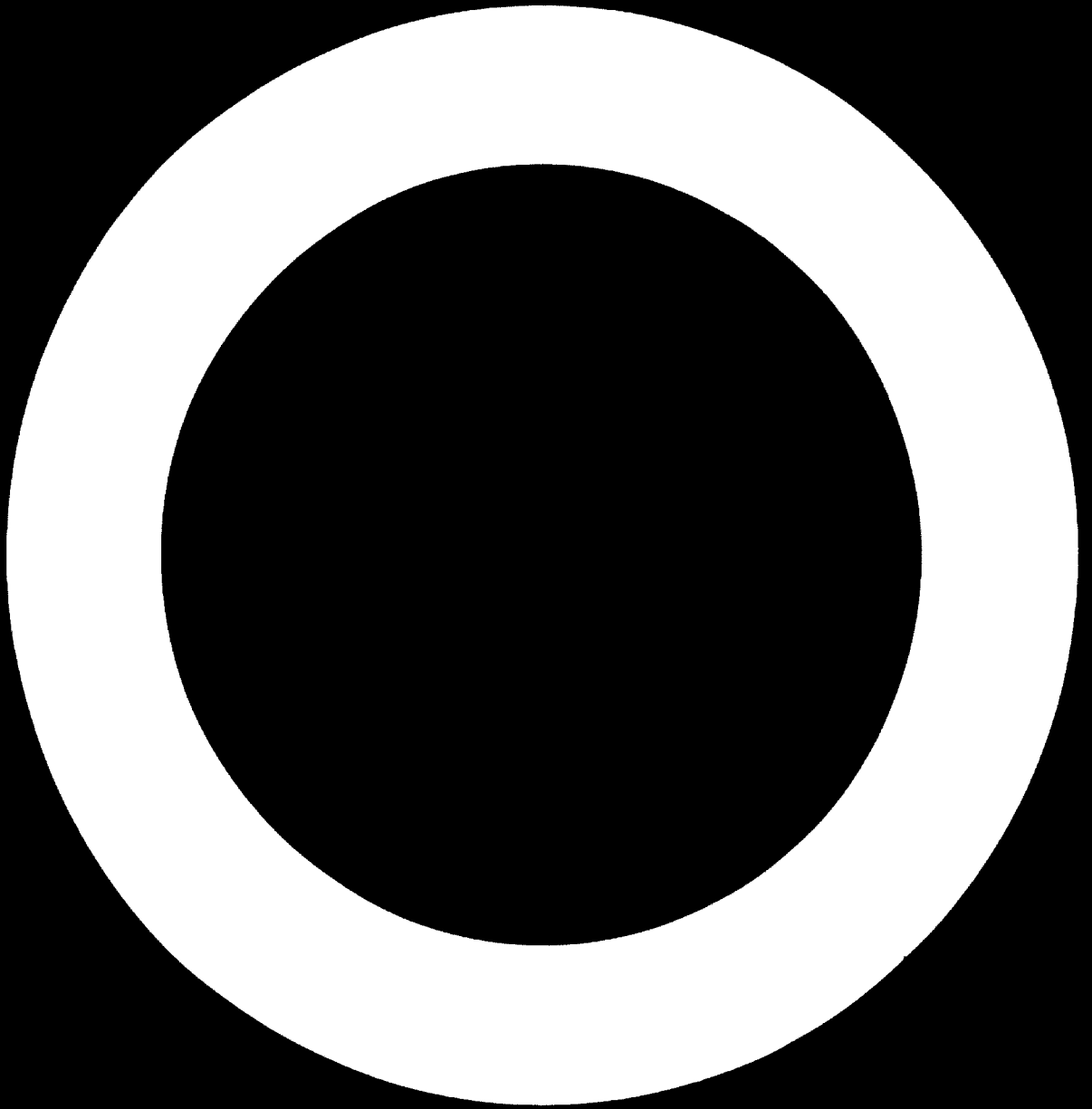
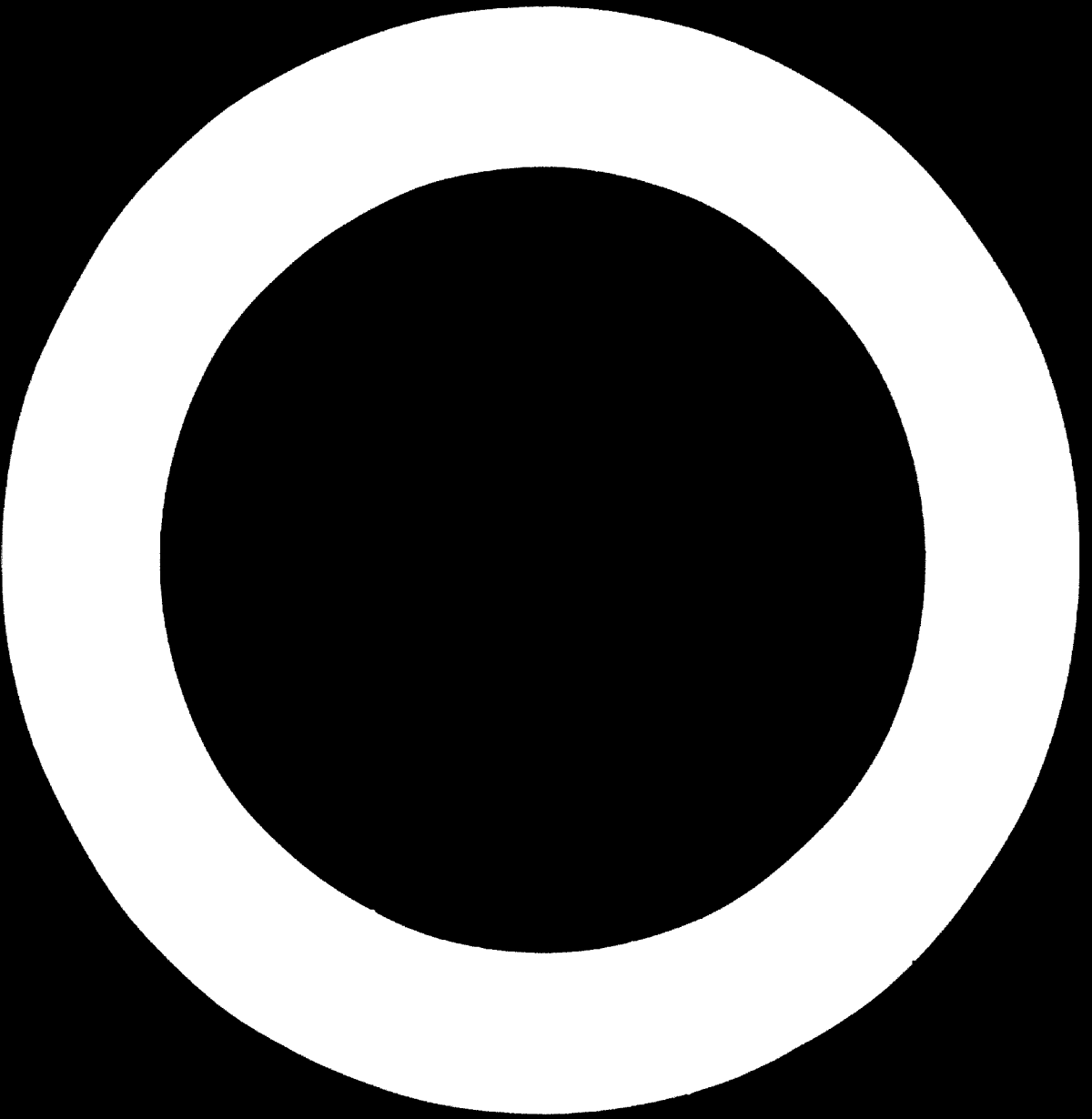


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1. INTRODUCTION

Purpose of the Mission

The UNIDO mission was organized in response to the request by the Government of Nicaragua (letter of Resident Representative, Mr. Oliden-Lopez to Mr. G. Polit, dated 8 April 1970), for a team of three plastics specialists headed by a UNIDO staff member. The team members, Mr. E.D. Dresner, Mr. K. Rohé and headed by Mr. H. May visited El Salvador, Nicaragua and Guatemala for the purpose of:

- (a) Visiting the UNDP Office in San Salvador and ICAITI and SIECA in Guatemala to determine the present status of the plastics fabrication industry in Central America;
- (b) Having discussions with the Government (INFONAC) and industrial authorities in Nicaragua to identify the areas needing technical assistance, to assist INFONAC in determining the order of priority in order to establish and strengthen the proposed Plastics Technology Centre and to prepare official request through the UNDP Regional Office for technical assistance.

2. ACKNOWLEDGEMENTS

The team gratefully acknowledges the valuable assistance received from:

Mr. J. Mufti, Deputy Regional Representative in San Salvador;

Mr. J.P. Gibson, Assistant Regional Representative in Managua;

Mr. A.E. Montano, UNIDO Expert attached to SIECA to advise on petrochemical development policy in Central America who accompanied the mission both in Nicaragua and Guatemala;

Mr. Eric Ericsson, UNIDO Field Adviser, who met the mission in Guatemala.

ABBREVIATIONS

C.A.	- Central America
C.A.C.M.	- Central American Common Market
H.D.	- High Density (polyethylene)
L.D.	- Low Density (polyethylene)
ICAITI	- Instituto Centroamericano de Investigación y Tecnología Industrial, Guatemala City
INFONAC	- Instituto de Fomento Nacional, Managua
MT	- Metric ton (1,000 kg)
POLYCARA	- Polimeros Centroamericanos S.A. Managua
P.T.C.	- Plastics Technology Centre, Managua
SIECA	- Secretaria Permanente del Tratado General de Integración Económica C.A.

3. PLASTICS CONSUMPTION IN C.A.

3.1 Consumption of plastics in the CACA is growing rapidly. According to recent estimate figures the situation is shown in:

Table 1

Consumption of Plastics Raw Materials (MT) in Central America

	<u>1963</u>	<u>1968</u>	<u>1970</u>	<u>1975</u>
Polyethylene (LD)	2,600	14,200	21,100	38,600
PVC (compounds)	1,000	5,400	9,900	20,400
<u>All other resins</u>	<u>1,200</u>	<u>5,400</u>	<u>12,300</u>	<u>29,300</u>
Total:	4,800	25,000	43,300	88,300
No. of enterprises	65	-	105	130
Total personnel	1,350	-	9,900	7,500
Total capital (C.A. \$millions)	8.5	7	45.2	80

Source: Mr. E. Ericsson (UNIDO Field Adviser) and Mr. E. Montano, UNIDO expert in petrochemicals attached to SIECA.

3.2 According to estimates by INFONAC the 1970 consumption in Central America should reach for polyethylene (HD) 1,100 MT, for polypropylene 4,500 MT and for polystyrene 1,500 MT.

3.3 Resins of Major Importance in Central America

3.3.1 Polyethylene (LD)

3.3.2 Polyethylene (HD)

3.3.3 PVC suspension and emulsion resins (already manufactured in Nicaragua)

3.3.4 PVC compounds

3.3.5 Polystyrene

3.3.6 Polypropylene

Nicaragua has begun, since 1966, the construction of C.A.'s first and only petrochemical complex which includes a caustic soda/chlorine/pesticides plant and a PVC polymerisation and processing plant. The PVC is currently consumed entirely within the CA Common Market. There are definite plans to establish plants for polyethylene and polypropylene based on a naphtha cracker.

3.4 The Plastics Processing Industries in Nicaragua

As in the most C.A. countries, the Nicaraguan plastics processing industry is operating on an extremely low level of efficiency, in spite of the fact that at least a major portion of the equipment used is technically up to date. The absence of continuous supply of reliable technical information and the lack of services and spare parts are primarily responsible for low output rates. Another major handicap is the fact that highly skilled labour on production supervision hardly exists. In general the industry suffers from disadvantages to be expected from its manner of development.

3.5 Quality of Products

The quality of standards observed differ greatly and vary from very low to high standards. However, the major portion of the products examined by the mission must be classified as fair. The absence of quality control and test procedures is one of the reasons why the quality level reached today is still below the U.S. and European standards. This is also related to the lack of control measures on raw materials which, primarily, are still imported from abroad. Insufficient knowledge in mould design, maintenance, product design and inadequate ancilliary equipment, and equipment handling has adversely affected the quality of the final product.

4. PLASTICS TECHNOLOGY CENTRE IN NICARAGUA

In order to improve the above mentioned situation in 1970, a Plastics Technology Centre (PTC) will be established by INFONAC in Managua with the objectives described below.

4.1 Scope and Activities of the Plastics Technology Centre

- 4.1.1 The PTC will provide technical and advisory services to manufacturers, processors and users of plastics. It is a non-executive body in all matters other than its own internal management.
- 4.1.2 The PTC will act as bridge between the Government and private interests in the plastics industry.
- 4.1.3 The PTC will also act as a bridge between the industry and the Universities and other educational and training institutions, translating the industry's needs for manpower in both quality and quantity to the Universities and Institutes and advising the industry on future requirements of trained personnel. It will also act as a catalyst to promote much closer contact between industry and the Universities than that exists at present.
- 4.1.4 The PTC will consult with other interested bodies and will take the initiative in developing quality standards for plastics products in both Nicaragua and C.A. and in doing the necessary missionary work to make these acceptable to all concerned.
- 4.1.5 The PTC will contact and co-operate with similar bodies in other countries, especially within C.A., and will endeavour to avoid duplication of effort and the laying down of specifications or regulations which will hinder C.A. trade in the future.
- 4.1.6 The PTC will set up and maintain a statistical and information department on plastics for the benefit of its members which should, in the interest of good public relations, be available to other interested bodies within reasonable limits. This department should also undertake publication of bulletins for members and should promote publication of appropriate information and articles on the plastics industry in other journals.

4.1.7 The educational programs of PTC especially the guidelines on seminars, training courses, professional meetings, etc. are more specifically outlined in "Suggested Working Plan for UNIDO Experts" (5.3)

4.2 Location

The sponsors (INFCNAC) decided to use for the beginning the building of the former Airport in Managua. These facilities are used for the time being as a Food Technology Laboratory sponsored by the Banco Central de Nicaragua (BCN).

4.3 Available Space

One spacious veranda-like room where all testing equipment could be easily installed. One smaller room where laboratory work could be performed. One very small room but sufficient for office work and file cabinets. It can be expected that after two to three years more spacious facilities will be necessary, but for a fast start the above premises should be adequate.

4.4 Internal Organisation

The Plastics Technology Centre will be incorporated as a national non-profit foundation in accordance to Nicaraguan laws. The possible sponsors in addition to INFCNAC, may include Banco Central, the University of Managua, POLYCASA and perhaps the Plastics Divisions of some of the Central American manufacturers associations. Private firms will be invited at a later date to join as members of the PTC.

5. SUGGESTIONS FOR WORKING SCHEME OF THE PLASTICS TECHNOLOGY CENTRE IN NICARAGUA

The UNIDO mission in consideration of the above mentioned situation would suggest the following working plan for the starting period of PTC:

- Assistance by four UNIDO experts, whose duties are described under 5.1.

- Seminars with UNIDO's experts participation according to 5.3
- Regarding testing equipment for plastics, several specialized firms have been already informally contacted as indicated in 5.2
- A training programme should be initiated as soon as possible under the guidance and instructions of the UNIDO experts to solve the most urgent problems of the plastics processing industry.

5.1 Staff of the Plastics Technology Centre

5.1.1 Director (Nicaraguan citizen with a University education, preferably in chemical engineering). Strong background in plastics technology, familiar with the specific local conditions in Central America; knowledge of English necessary. Full time employed.

5.1.2 Technician (Nicaraguan citizen) with good background in processing, applications and testing of plastics, knowledge of English useful. Full time employed.

5.1.3 Manager (UNIDO expert, 6 months). He will advise on the organization, management and operations of the Plastics Technology Centre. For these purposes, he will discuss with plastics manufacturers and converters in establishing the order of priorities in solving the problems of the industry. These include, specifications for testing and ancillary equipment, short and long range programmes of work including future technical assistance required by the Centre. In collaboration with other experts, he will design a training programme to be arranged by the Centre. Qualifications - plastics specialist with extensive experience in the above field. Language: Spanish and English.

5.1.4 Plastics technologist (semi-finished goods) assigned by UNIDO to the Plastics Technology Centre for 6 months. He will advise the plastics converters about up-to-date techniques in extrusion, spread-coating, laminating, printing and other finishing processes in order to improve efficiency, quality of products and to introduce new processes. He will advise on

tooling in the above area and take-off systems. In collaboration with the manager of the Centre, he will advise on the training programme related to his field of competence. Qualifications - plastics engineer with extensive experience in the above area. Language - Spanish and English.

5.1.5 Plastics technologist (finished and shaped articles) assigned by UNIDO for 6 months to the Plastics Technology Centre. He will work in the Plastics Technology Centre to advise the converters injection moulding, blow-moulding, blister forming, rotational casting in order to improve efficiency, quality of products and to introduce up-to-date techniques. He will also advise on mould design and mould making. In collaboration with the manager of the Centre, he will advise on a training programme related to his field of competence. Qualifications - same as No. 5.1.4.

5.1.6 Plastics quality control expert assigned by UNIDO for 6 months to the Plastics Technology Centre. He will work in the Centre to advise the manufacturers and converters on testing, quality control and standards. In collaboration with Instituto Centroamericano de Investigacion Tecnol. y Industrial (ICAITI), he will work on establishing standards to be adapted for Central America. Qualifications - same as No. 5.1.4.

5.2 Testing Equipment required by the Plastics Technology Centre

During his visits to Europlastic and Achema in June 1970, Mr. Dresner took the opportunity of discussing with several specialised firms manufacturing certain plastics testing equipment considered suitable for the initial phase of operations of the PTC in Nicaragua.

- 5.2.1 Utotechnique Industrielle d'Engien, Engien (S and O), France
- 5.2.2 The Small Power Machine Co. Ltd., South Harrow, Middx. U.K.
- 5.2.3 Lhomargy S.L., Draveil, France

5.2.4 CAMIL, Maisons-Alfort, France

5.2.5 Diproma, Roubaix, France

5.2.6 Vertex Works, Tetbury, Gloucestershire, U.K.

5.2.7 Brabender A.G., Duisburg, Germany

Details of the offers will be studied by UNIDO and will be discussed with INFONAC.

Although the final choice rests with the PTC, however, the mission would consider the "Combined Test Plants" of 5.2.4 with multipurpose uses as one of the most suitable equipment to be acquired by PTC because the equipment has the following salient features:

- (1) Electrical heating: 250°C, possible increase up to 350°C (without lubrication). Suitable for processing plastic materials, rubber and any pasty or hard products.
- (2) 2 Roll Mixer: Preparation of plastics or rubber mixes. Production of compounds or master-batches. Processing of pastes, paints, printing inks, etc. Aging tests of polyethylene on heating and rotating rolls.
- (3) Calender: Drawing of sheets, lamination on backing materials (textiles, paper, metals).
- (4) Extruder: with or without belt conveyer and granulator (removable). Extrusion of plastic or rubber. Production of strips, tubes, electrical cables, etc.
- (5) Blade Mixer: of high power, operating as a small internal mixer. Heating and cooling. Two speeds. Suitable for producing very thick and viscous compounds.
- (6) Compression Press: 10 to 12 tons - 250 kg/cm² - 2 or 4 platens upon request - heating and cooling - moulding - vulcanisation - lamination - cutting - forming.
- (7) Injection Press: for plastics (16 g.)
- (8) Oven: for pre-heating or aging, with or without ozone, hot air vulcanisation.

Cost approximately US\$12,000.

In addition, a Brabender plastificator - extruder (various types) of 5.2.7 should be considered. Cost approximately US\$15,000.

5.3 Suggested Working Plan for UNIDO Experts

- 5.3.1 Manager (co-ordinator) of the Plastics Technology Centre
 - 5.3.1.1 Internal organization and collaboration scheme with sponsors
 - 5.3.1.2 Scheduling of seminars and conventions, invitations to participants, emphasizing the non-profit and independent character of the Plastics Technology Centre
 - 5.3.1.3 Promotion: Scope and activities of the Plastics Technology Centre requesting collaboration with plastics processing firms in Central America
 - 5.3.1.4 Briefing of UNIDO's technologists, and directives for the first convention and seminar. The entire working programme has to be well planned and executed. If the selected equipment at that time is still not installed, the Manager has to set up a programme in collaboration with POLYCASA which is willing to make available their laboratory equipment for demonstrations on a limited scale, in order not to be interrupted in their routine testings.
- 5.3.2 Plastics Technologists (semi-finished and shaped articles)
 - 5.3.2.1 Visits to plastics processing firms working in this field
 - 5.3.2.2 Programming of seminars and demonstrations
 - 5.3.2.3 Instructions on plastics processing
 - 5.3.2.4 Advice on up-to-date tools, repairs and design of moulds
 - 5.3.2.5 Setting up of training programmes for technicians
- 5.3.3 Plastics Technologist (finished shaped articles)
(same as under 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.2.4 and 5.3.2.5)

- 5.3.4 Plastics quality Control Technologist
- 5.3.4.1 Evaluation of raw materials, basic resins, plasticisers, stabilizers, pigments, fillers and lubricants
- 5.3.4.2 Evaluation of finished goods
- 5.3.4.3 Heat stability tests
- 5.3.4.4 Light stability tests
- 5.3.4.5 Aging tests
- 5.3.4.6 Mechanical properties tests
- 5.3.4.7 Collaboration with ICAITI on setting up of Central American standards in view of the specific local conditions including toxicity tests.

6. RECOMMENDATIONS

6.1 The problems for the Nicaragua Plastics Industry have been indicated in the main text of the report. These problems are neither new nor peculiar to Nicaragua or Central America, but have been met by processors during the development of the plastics industry of most other countries. They are however, likely to become specially urgent in Nicaragua during the next five years due to the accelerated rate of growth required by the development of domestic production of thermo-plastic resins and end products. Given time the Nicaragua industry would solve its problems as the plastics industries in other countries have done. However for Nicaragua time is the limiting factor and assistance is urgently needed to speed up the process and direct the whole development on proper lines.

6.2 UNDP and UNIDO could do much to help and these recommendations are designed principally to assist in the development of a request for short term assistance by four plastics specialists described under Section 5. The work of the UNIDO experts will pave the way for a more extensive programme of UNIDO technical assistance to the plastics technology centre in the form of experts, fellowships and equipment lasting 3 - 5 years envisaged for 1971 - 72. In this connexion, INPONIAC should make the official request for the four short term experts as soon as possible.

6.3 In the present early stages of the establishment, the organization of the PTC is rather rudimentary and its functions not yet well defined. It is essential therefore that the statute and by-laws of the centre should be established without delay.

6.4 It is necessary to ensure that when outside assistance such as that to be provided by UNIDO is being used, Nicaragua counterparts of ability are available so that the experts' help may be transmitted and used to the best advantage.

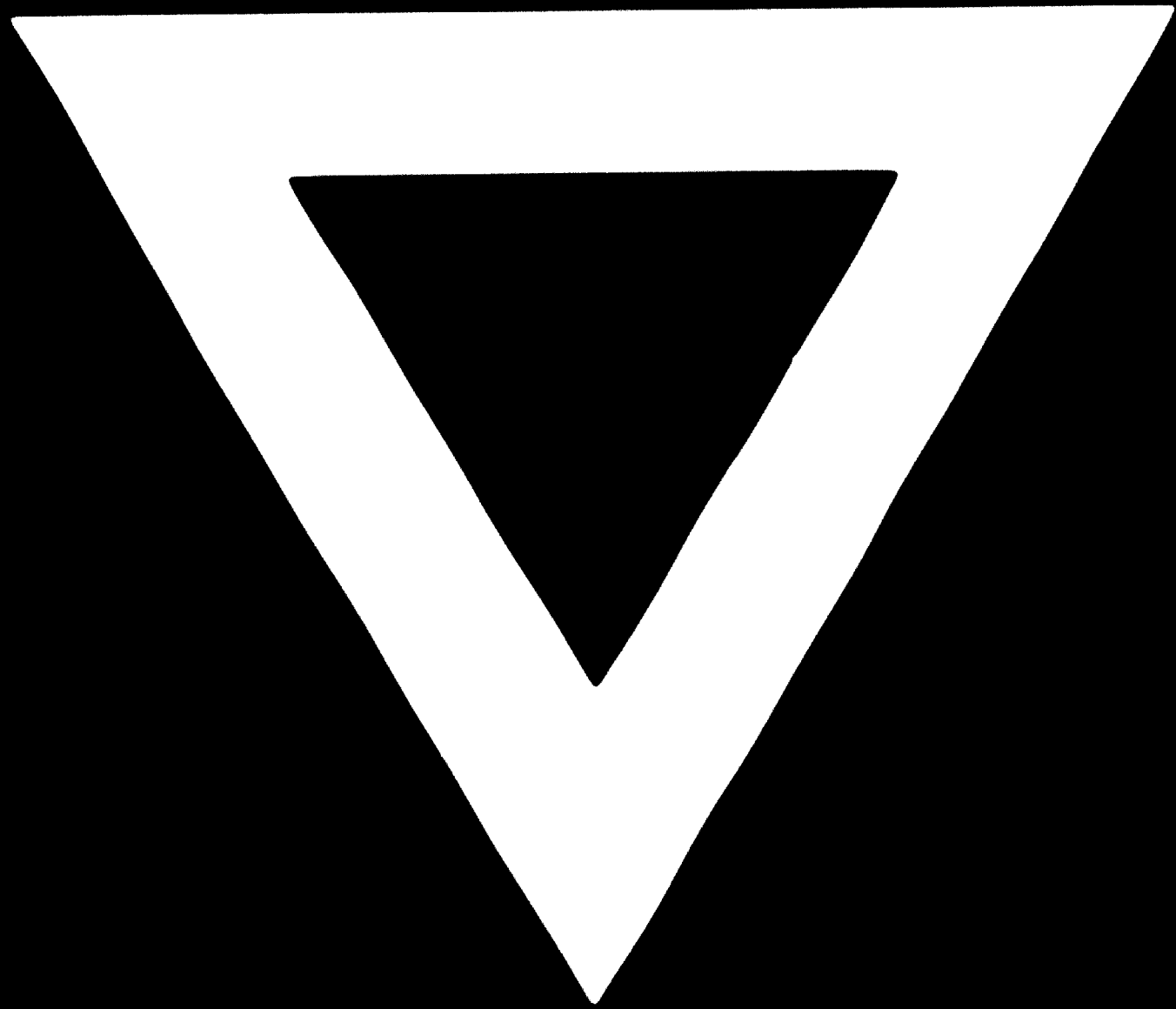
6.5 The PTC should inform UNIDO on all future developments and on the implementation of the project through experts assigned by UNIDO.

6.6 INFOMAC should encourage the centre to establish and develop contacts with similar institutions and with private companies both in Central America and outside. An important part of this process could be the regular organization of conferences, seminars and exhibitions in which other countries would participate by sending lecturers and exhibits. One of the functions of the UNIDO experts will be to assist in carrying out this particular purpose.

6.7 The PTC in collaboration with the UNIDO experts should develop suitable training courses for implementation for training operators, specialist craftsmen and technicians, getting outside help in the layout of the courses and in the teaching as required. Arrangements should be made for industrial fellowships which will permit local personnel to gain experience of the industry in other countries.

6.8 Quality control measures should be initiated as a matter of great urgency. These should start on the incoming raw materials and go on to finished products. Such measures do not need to wait for development of official standards. At least they will ensure consistent quality even if it is not high enough to meet the eventual standard and the information obtained from them will be of inestimable value for the development of the final standards.

6.9 In the near future INFOMAC and PTC should work out in consultation with the short term UNIDO experts a detailed plan for further assistance by UNIDO including experts, fellowships and equipment to begin in 1971 - 72.



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