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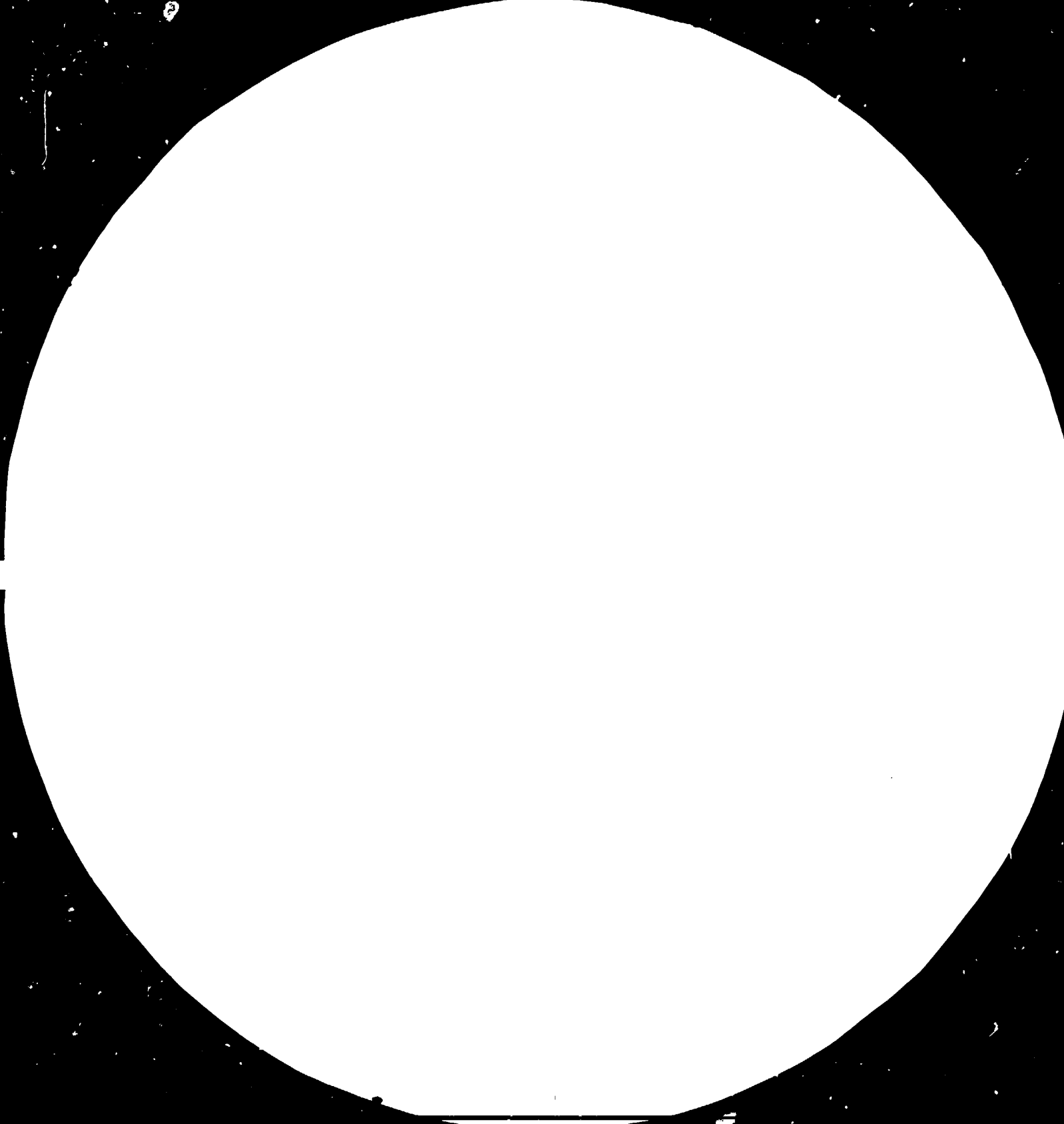
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مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

يكتوريا - اسكندرية

14646

DP/EGY/81/029

ENGLISH

THE PLASTICS INDUSTRY  
IN  
THE ARAB REPUBLIC OF EGYPT

Egypt.

THE PROVISION OF TECHNICAL ASSISTANCE TO THE  
PLASTICS DEVELOPMENT CENTRE AND PROCESSORS IN  
THE INDUSTRY

April 1985

K.E. Andrews

The writer of this report is solely responsible for the views expressed there in. They do not necessarily reflect the views of the Secretariat of UNIDO.

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SUMMARY:

The main objectives of the mission were to :-

- Continue the training of the PDC staff in the operation of the pilot plant.
- Conduct a one week training course for industry representatives in extrusion.
- Initiate a survey of activity in the Egyptian Plastics Industry that would ultimately provide a complete picture of plastics consumption, people employed and machinery used.

An extensive programme of extruder experiments were conducted including polyethylene low density film, high density polyethylene film and pipe extrusion. The parameters governing die design, the effect of linear polymers and the effect of temperatures were all examined.

A week training course was run covering some of the same ground and twelve industry representatives attended.

A questionnaire was written to start the industry survey and in all nearly twenty companies were visited with a good response. Members of the counterpart team were instructed in the techniques of interviewing.

A continuing programme of work was agreed to carry out on throughout the rest of 1985 on the pilot plant, training programmes and industry study work.

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1. INTRODUCTION:

There was some confusion over the job description. The one provided by the UNIDO office in Vienna is somewhat different from the one presented in the PDC on arrival. This problem was quickly resolved and a work programme was drawn upon the basis of the agreed priorities. Both job descriptions and the agreed programme of work are appended to this report.

In essence the work comprised three elements representing a compromise of the work possible during the mission.

- 1) To carry out training of staff on the pilot plant equipment with emphasis on extrusion and injection moulding with extrusion being the priority. (Labeled item 1 on the programme).
- 2) To prepare agree and conduct a training programme of one week duration for industry representatives, mainly addressed to the subject of extrusion. (Labelled item 3 on the programme).
- 3) To conduct the most extensive survey possible in the time available on the size and constraints facing the Egyptian Plastics Industry (Labelled item 2 and 4 on the programme).

Although difficulties were experienced particularly in the arrangements for the visit programme progress was made thanks to the help of Mrs. Nadia Nosseir for which I would like to express my appreciation.

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The main counterpart staff involved in the activities were :-

- Ibrahiem Masoud
- Mohamed Kamal
- Hanan El Samak
- Heba El Refaey
- Sayed Abdel Rahman

Others were included in specific parts of the work.

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2. Pilot Plant Work

2.1 Extrusion of film

The first study on the pilot extruder covered blends of Linear Low Density Polyethylene with standard low density material. Initial runs showed the expected rise in die pressures as the proportion of linear material was increased and subsequent lab tests demonstrated the increase in tensile and extensibility of the film. However at the lower die pressures with standard low density material a design fault in the die was very apparent in the form of excessive lines around the spider.

Attempt to remove the fault by modification of the fixed compression ring together with correction of the die heater wiring resulted in significant improvements, but failed to remove the problem completely. A new pin was made with detachable compression rings and a series of experiments conducted examining the following factors :

- The effect of compression ring size on die pressure.
- The effect of melt viscosity changes brought about by material and temperature changes.
- The effect of groves in the compression ring.
- The effect of polishing of the die on smoothness of the film and removal of die lines.

Adequate film was produced and the PDC staff acquired a better understanding of the factors affecting film die design. A second series of trials involved the production of High Density Polyethylene film but these were incomplete due to the lack of the correct grade of high density polyethylene at the Centre. Using the best available material ie. a bottle blowing grade, staff of the PDC were instructed in the :-

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- Effect of blow up ratio on film characteristics.
- The correct shape and appearance of the bubble for HD film.
- The need for a much higher degree of control of the air ring in running this material.

Modifications were made to the fan control shutter to improve the adjustability of the unit but even so, the level of control leaves much to be desired. During the course of factory visits the staff of the PDC had the opportunity to examine the "Iris" type fan control units common in production lines.

This part of the pilot plant programme brought out some points for further consideration :-

- A new control unit should be obtained for the fan inlet to make it more adjustable.
- The correct film grade of High density polyethylene should be obtained and a further series of experiments carried out on the production of high density polyethylene film.
- A new pin should be manufactured with a smaller annular aperture on the film die and its effects on the quality of high density film should be examined.

## 2.2 Extrusion of Pipe

The Betol extruder was set up to run low density polyethylene pipe. The first series of trials were carried out using the thin section die and sizing rings and the wall section of the pipe produced proved unsatisfactory. The line was then changed over to the slightly larger die and rings, this produced pipe of good quality. A detailed examination of Betol cutting unit showed that it could be made to cut at rates up to 4500 per minute and whilst it will never prove wholly satisfactory

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as a pelletising machine it will enable the PDC staff to conduct preliminary experiments on compounding until a proper piece of equipment is obtained.

- \* It is suggested that a small spaghetti die be put in hand along the lines discussed with PDC staff and preliminary compounding trials to manufacture coloured polyethylenes and polystyrenes be made.

2.3 Compounding :

One of the most important aspects of assistance to the plastics industry which showed itself clearly in the series of factory visits that we made, was the need for provision of training. The PDC is already well equipped to provide training in a wide variety of test procedures for quality control purposes and some impact is beginning to be made in both the provision of training and the supply of test services. To complete its range of equipment for training on pilot plant two main processes are required :

- The ability to compound plastics materials.
- The ability to thermoform plastics sheet.

In the next phase of development of the PDC services it is recommended that equipment should be obtained for compounding. This would fit in well with the expected production of PVC materials latter this year in Egypt and future extension of the Petrochemicals Project to Polyolefines.

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The total equipment required for the purpose comprises:

- 1 high speed mixer (Laboratory size) with cooling mixer
- 1 laboratory compounding extruder
- 1 spaghetti die, water bath and rollers
- 1 air knife
- 1 pelletiser

Anxillary equipment would include

A suitable face cutter for PVC

A small drum mixer for dry blending of pigments.

It is suggested that quotations and specifications should be obtained by the PDC from appropriate suppliers. The high speed mixer could be obtained from Henschel in West Germany or TK Fielder in the UK. (There are other suppliers and a 5 to 10kg. size would be appropriate). The extruder together with all the in line equipment and anxillaries would best be obtained as a complete unit from the extruder suppliers. Some of the best companies in this field of laboratory size equipment are:

Werner Phleiderer, West Germany

Leistrizt, West Germany

Baker Perkins, U.K.

It is suggested that each be asked to put forward a proposal for a complete line capable of :

- 1) Compounding rigid and flexible PVC
- 2) Compounding of coloured PE-PP-PS with appropriate additional screws as necessary.
- 3) In the long term of compounding filled and reinforced engineering polymers.

The proposals should be checked for technical content by an appropriate expert before finalization.

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3. Injection Moulds:

A mould design was produced by the staff of the PDC to make the 1/8" and 1/4" izod impact specimens and correct the gap left by improper specifications of the original test specimen mould purchased with the Windsor Injection Moulding machine. This begun the process of learning in the design of moulds. This mould drawing has been sent for checking and quotation to local mould producers. Its needs to be followed up and manufactured so that the laboratory test procedures can be extended to include izod impact.

1. Industry Survey

During previous missions to the PDC the importance of information on the structure and size of the Egyptian Plastics Industry has been stressed. The purpose of obtaining this type of information is :

- To enable the Plastics Development Centre to function as a focus for information about the industry, its needs, and its problems.
- To enable the Plastics Development Centre to properly plan its future work programme and maximise its service to the industry.
- To train the staff of the PDC in the process of information gathering and provide a long term base for a marketing research unit, as a service to the plastics industry.

During this mission a start was made on this process of information gathering. A questionnaire was designed, used in preliminary interviews, modified in the light of results and a copy of the final form is appended to this report.

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Some factories were visited and PDC staff trained in the techniques of interview work, analysis sheets were drawn up and a beginning made on examining the data obtained. Copies of these preliminary analysis sheets are appended to this report. A list of all the companies known to the Plastics Development Centre was made, with where possible, complete addresses, telephone numbers and telex numbers. Additions were made to the list during the course of work. Although the current list contains almost 250 operating companies it can in no way be regarded as complete and the rate of addition that occurred in the modest interview programme suggests that an ultimate total of 350-450 would not be unrealistic and the number could be considerably higher.

This initial analysis shown in Appendix (5), identifies an annual consumption in excess of 120,000 tonnes for only nineteen companies and particular PVC consumption of 65,000 tonnes representing 81% of the name plate capacity of the new PVC producing unit and suggests that it is unlikely to meet the country's total demand. It is too early to make any reliable estimate of total plastics consumption, or individual polymer consumption figures, within Egypt, but a final number of half a million tonnes would not be surprising. It is important that this work be completed and the following programme is suggested.

- Interviews should be continued at a rate of 8-10 per month so as to obtain at a least a fifty percent sample of known companies over the next year.
- The list of companies should be constantly updated and improved.
- One person should act as focus for all information on Egyptian Plastics companies and all members of the PDC staff should ensure that new companies' data is passed to that person for correlating.

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- One person should act as focus for analysis of overall, consumption of materials, machines etc. That person should be gardian cf all visit reports and constantly update the analysis.
- A secondary project aimed at discussions with all major suppliers of raw materials or their agents in Egypt should be put in hand to provide a cross check on the data obtained from operating companies. (This has been discussed with PDC staff).
- Attempts should be made through all available government sources to identify plastics companies in all parts of Egypt (eg. GOFI).

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5. EXTRUSION TRAINING PROGRAMME

An extrusion training programme was arranged covering a one week period and whilst theoretical aspects and testing were incorporated the main emphasis was on actually running the machine. A copy of the programme is shown in Appendix (6).

The main work elements included in the programme covered the same elements as those used in training the PDC staff and every attempt was made to leave as much of the work as possible to PDC counterparts so that they would be in a position to repeat the training programme with the industry representatives. A lecture given during the programme, appendix 7), is also included a similar lecture was also delivered to students at the Alexandria University.

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6. RECOMMENDATIONS

The recommendations in this report are set out in line with the work programme completed during the mission.

6.1 FILM EXTRUSION

- 6.1.1 A new control unit should be obtained for the fan inlet on the air ring to make it more adjustable.
- 6.1.2 The correct film grade of High Density Polyethylene should be obtained and a further series of experiments carried out on the production of high density polyethylene film.
- 6.1.3 A new pin should be manufactured with a smaller annular aperture on the film die and its effects on the quality of high density polyethylene film should be examined.

6.2. COMPOUNDING

- 6.2.1 A small spaghetti die should be drawn and manufactured to enable staff of the PDC to begin compounding trials with polyethylene and polystyrene.
- 6.2.2 Details of the equipment required to enable the PDC to embark on a proper compounding programme are given in the body of the report. These should be progressed.

6.3. INJECTION MOULDING

- 6.3.1 The new mould designed during the mission should be manufactured so that the range of laboratory tests can be more complete.

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- 6.3.2 At least two members of the PDC staff should be seconded to the mould design department of a suitable company for a minimum period of one month, for training in mould design.
- 6.3.3 During 1986 one member of the PDC staff should be sent for training in mould design to a suitable place outside of Egypt. Selection should be based on merit and the results of recommendation 3.2
- 6.3.4 The training programme for a lathe operator recommended previously and arranged by the PDC should be actioned with all possible speed.

6.4. INDUSTRY SURVEY

- 6.4.1 Further interviews with industry should be conducted at a rate of 8 - 10 per month so as to complete around 50% of known factories by the end of 1985.
- 6.4.2 This list of companies prepared during the mission should be constantly up dated using all available data including government sources such as GOFI.
- 6.4.3 One person should be act as a focus in the PDC to ensure that company data is collected from all sources.
- 6.4.4 One person should be responsible for analysis of survey data and all visit reports should be kept by the person.
- 6.4.5 A secondary project to obtain information from material suppliers has been initiated and this needs to be carried through.

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

January 1985

Project in the Arab Republic of Egypt.

**JOB DESCRIPTION**

DP/EGY/81/029/11-64/32.1.H

|                    |   |
|--------------------|---|
| Post title         | Plastics Technologist (Industry Survey)   |
| Duration           | Two months  |
| Date required      | As soon as possible   |
| Duty station       | Alexandria, with travel within the country  |
| Purpose of project | Establishment of a Plastics Development Centre (PDC) to undertake and provide technical support necessary for both strengthening and expanding the national plastics industry.  |
| Duties             | <p>The technologist in collaboration with his counterpart, will specifically be expected to:</p> <ol style="list-style-type: none"> <li>1. Visit selected factories, collect appropriate data relative to the number of employees, graduates employed, process equipment used and age, products produced, nature of market served and any plans for expansion.</li> <li>2. Ascertain the nature and degree of constraints faced by the processors both technically and in market development.</li> <li>3. Make recommendations regarding the action to be undertaken by the Plastics Development Centre that can assist the processors in resolving the identified constraints. State priority items.</li> </ol> <p>The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.</p> |

Applications and communications regarding this Job Description should be sent to:

Project Personnel Management Section, Industrial Operations Division

**Qualifications**      Plastics technologist or chemical engineer with extensive experience in the plastics processing industry. Should be familiar with various processing equipment and able to talk easily with senior management personnel. Previous experience in working in a developing country essential as well as an ability to assess plastics processing problems.

**Language**            English

**Background information**

There are more than 300 processors in the country using about 80,000 tons of plastics raw materials. The Government is planning to set up a petrochemical complex to produce annually 150,000 tons of polyethylene and 100,000 tons of PVC. However, a number of problems are encountered by the local plastics industry in their efforts to achieve an orderly, efficient and rapid expansion. Shortage of trained personnel, lack of control standards, good mould design and making facilities, knowledge of the requirements of plastics for the user and sufficient experience in application development are some of the immediate problems.

With the growth of the plastics industry a communications system must be built up between the raw material producers, the equipment manufacturers, the plastics processors, the plastics trade and users to ensure that efforts are directed into the most beneficial channels for all.

Appendix (2)

JOB DESCRIPTION

DP/EGY/81/029/11-02 32.1.H

- Post title: Consultant in Plastics Processing Plant and Plastics Industry generally.
- Duration: 2 m/m.
- Date required: March and April 1985
- Duty Station: Alexandria, Egypt.
- Purpose of Project: To improve and diversify the ability of the PDC to serve the purpose of the agricultural industry and to extend the work of the PDC in the service of other fields of the plastics industry.
- Duties: The consultant in collaboration with the counterpart staff will be expected to :-
- 1) Advise and train counterpart staff in the operation of all the pilot plant available at the PDC.
  - 2) Assist in training of PDC staff in the techniques of identifying plastics industry needs that can be served by the PDC in the future.
  - 3) Assist PDC staff in conducting a one week training course for industry representatives in injection moulding techniques.
  - 4) Together with PDC staff make extensive factory visits to assist in problem solving and help counterpart staff to form industry links of a lasting type for the future.
- Qualifications: Plastics technologist or engineer with extensive experience in plastics processing, a knowledge of the industry generally and particularly experience in acting as a consultant in developed countries. Previous work in developing countries would be advantage.

Language:

English.

Background

There are more than 500 plastics processors in the country with some of 10 companies producing 60% of the total products using mainly imported raw material. Total per capita consumption of plastics raw material is about 100,000 tons including polyethylene, polypropylene, polystyrene, polyvinyl chloride, nylon, acrylics and thermosetting plastics.

The Petrochemical Project for the manufacture of suspension polymerized PVC is expected to commence manufacture in 1985. However, there are a number of problems encountered by the local plastics industry in their efforts to achieve an orderly efficient and rapid expansion. Shortage of trained personnel, lack of quality control standards, good mould design and mould making facilities, knowledge of requirements of plastics for the user and of sufficient experience in application development are some of the immediate problems.

With the growth of the plastics industry, a communication system must be built up between the raw material producers, equipment manufacturers, plastics processors, plastic trade and the users to ensure that efforts are directed into the most beneficial channels for all.

| WEEK COMMENCING | JOB DESCRIPTION LINE                                    |  |   |
|-----------------|---|--|---|
|                 | (1)   | (3)  | (2 + 4)   |
| Sunday 10 March | As time permits<br>priority extrusion<br>and injection. | Prepare and agree<br>shape of training<br>programme. | 1) Prepare questionnaire and<br>visit lists. Begin to set<br>up interviews.   |
| Sunday 17 March | - DO -  | Finalise training<br>programme.                      | 1) Set up and evaluate inter-<br>views with staff.  |
| Sunday 24 March | - DO -  | Circulate programme                                  | 1) Set up and conduct interviews<br>with staff.<br>2) Get staff to do interviews<br>alone.<br>3) Check and amend questionnaire<br>as appropriate. |
| Sunday 31 March | - DO -  | - DO -   | 1 and 2 as in previous week.  |
| Sunday 7 April  | - DO -  | - DO -   | 1 and 2 as in previous week.  |
| Sunday 14 April | - DO -  | Hold seminar   | Analyse data and check.   |
| Sunday 20 April | Finalise and report                                     | Discuss results<br>and report.                       | Final analysis and report.  |
| Sunday 28 April | Final   | Discussion Travel                                    |   |

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

Appendix (4)

- 19 -

Name of Company:

Date:

Address:

Person interviewed:

Title:

1) Can you tell me something about your company (ie. age, private, public, more than one site etc.)

-  
-  
-  
-

2) What do you see as your main activities? What do you see as the annual growth rates in each of the sectors in which you engage?

Tick more than one box if necessary.

|                 | Injection | Extrusion | Blow moulding | Thermo-forming | Compounding | Compression | others |
|-----------------|-----------|-----------|---------------|----------------|-------------|-------------|--------|
| Prime           |           |           |               |                |             |             |        |
| Secondary       |           |           |               |                |             |             |        |
| % annual growth |           |           |               |                |             |             |        |

TEL NO  
CABLE. EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P O BOX 1517 W. H. O. ALEX

تليفون  
تلفزيون  
تلكس : ٥٤٢٢٣  
ص. ب. ١٥١٧، الصحة العالمية لاسكيا



مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

CTORIA - ALEXANDRIA

فيكتوريا - اлександريه

-20-

- 3) How do you see your company, as a market leader in your sector, in the middle or a smaller company? Can you indicate what the size of the various sectors in Q2 are in Egypt as a whole ?

Injection

Extrusion

Blow moulding

Thermoforming

Compounding

Compression

Others

- 4) We are trying to identify the consumption of plastics materials in Egypt and we would like to fill in the table for your company. This is taken in two sections commodity polymers and special materials. We must emphasise that the data you give us will be collected into an industry view and your factory information will be treated as confidential and not shown in any report. Precise figures would be helpful but if not bracket figures will be adequate.

Commodity Polymers

Please tick appropriate boxes, ensure none is entered in each box if the answer is none.

|    | Less than 100 | 100 - 500 | 500 - 1000 | 1000 - 5000 | over 5000 |
|----|---------------|-----------|------------|-------------|-----------|
| PE |               |           |            |             |           |
| PE |               |           |            |             |           |
|    |               |           |            |             |           |
| C  |               |           |            |             |           |

L NO  
B.L.E. EGYPLASTIC  
.EX 54223 EGYPLAS UN  
) BOX 1517 W: H O. ALEX

تليفون  
تلفارفا: ايجي بلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب ١٥١٧ الصفة العاليه الاسكندرية

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 1 -

Special Polymers

Please tick boxes or enter figures, state none if none is consumed.

|            | 0 - 50 | 50 - 100 | 100 - 500 | 500 - 1000 | over 1000 |
|------------|--------|----------|-----------|------------|-----------|
| ABS        |        |          |           |            |           |
| PC         |        |          |           |            |           |
| Acrylic    |        |          |           |            |           |
| Reinforced |        |          |           |            |           |
| Others     |        |          |           |            |           |

Please specify others :-

-

-

6) Who are your main suppliers (eg. DOW, ESSO, HULS, HOECHST, etc.) agents we do not want, only the prime manufacturers.

-

-

-

-

-

-

7) What are your main products and what are the prime materials used for them? We ask for the volumes because in addition to total polymers consumed we are interested in the end uses as a measure of grade requirements.

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BLE EGYPLASTIC  
LEX 54223 EGYPLAS UN  
BOX 1517 W H O ALEX

شلفون  
شلفون في ايجيبلاستيك  
شلفون : 54223  
ص.ب. 1517 الصفة العامة لاسكيب

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

-22-

7a) Extruded Products

Try to obtain volumes in each box.

Film  
Profiles  
Pipes  
Others  
Please specify

| LDPE | HDPE | PS | PP | PS | PVC | Others |
|------|------|----|----|----|-----|--------|
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |

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7b) Injection moulded products

Try to obtain volumes in each box, if not totals for each product or percentages from which we can subsequently make estimates.

Packaging  
House wares  
Industrial  
Toys  
Others (please specify)

| LDPE | HDPE | PS | PP | PS | PVC | Others |
|------|------|----|----|----|-----|--------|
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |
|      |      |    |    |    |     |        |

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TEL NO  
TABLE EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
PO BOX 1517 W H O. ALEX

تليفون  
شعارها ايجيبلاستيك  
شكس : ٥٥٢٢٣  
ص.ب ١٥١٧ الصفة المالية الاكدمية

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

ICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

-23 -

7c) Blow Moulded Products

In this section we are interested in two factors, where the main emphasis of production lies in terms of the size of the products, and their end use markets.

Note 1) Try to obtain volumes in each box, if not totals for each product or percentages from which we can subsequently make estimates.

2) Where none state none.

small 0-1 litre  
medium 1-5 litres  
large over 5 litres

| HDPE | LDPE | PP | PVC | Others |
|------|------|----|-----|--------|
|      |      |    |     |        |
|      |      |    |     |        |
|      |      |    |     |        |

Packaging  
Industrial  
Others Specify

| HDPE | LDPE | PP | PVC | Others |
|------|------|----|-----|--------|
|      |      |    |     |        |
|      |      |    |     |        |
|      |      |    |     |        |

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-

EL NO.  
ABLE: EGYPLASTIC  
ELEX 54223 EGYPLAS UN  
O BOX 1517 W H O ALEX

تليفون  
تلفازها: ايجي بلاستيك  
تلكس: ٥٤٢٢٣  
ص.ب. ١٥١٧: المصنعة المصرية للاستيك

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 24 -

7d) Compounding

Note 1) Try to obtain volumes in each box, if not totals for each product or percentages from which we can subsequently make estimates.

Compounded for sale  
Compounded for internal use  
Only colouring  
Adding fillers  
Reinforcing  
Others

| HDPE | LDPE | PP | PS | PVC | Other |
|------|------|----|----|-----|-------|
|      |      |    |    |     |       |
|      |      |    |    |     |       |
|      |      |    |    |     |       |
|      |      |    |    |     |       |
|      |      |    |    |     |       |

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-  
-

7c) Thermoforming

Note 1) Try to obtain volumes in each box, if not totals for each product or percentages from which we can subsequently make estimates.

Packaging  
Industrial  
Others (specify)

| HDPE | LDPE | PP | PS | PVC | Others |
|------|------|----|----|-----|--------|
|      |      |    |    |     |        |
|      |      |    |    |     |        |

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TEL NO  
CABLE EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P.O. BOX. 1517 W.H.O. ALEX

شلفون  
شلفون ايجيبيلاستيك  
شلفون : 54223  
ص.ب. 1517 المصحة العالمية لالاستيك

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

ICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 25 -

7f) Pressure moulding (respondant to specify polymer type phenolic melamine etc.)

Thermosets

Thermoplastics

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|  |  |  |  |  |

8) We now want to look at machinery used in your company under the same process headings as before

8a) Extrusion

|                       | Total numbers | Average age | Place of origin* |
|-----------------------|---------------|-------------|------------------|
| Single screw machines |               |             |                  |
| Twin screw machines   |               |             |                  |
| Any special types     |               |             |                  |

Comment on special types

-  
-  
-

- In terms of place of origin we are looking at the detail but only require to split into main heading

- A Local manufacturer
- B European manufacturer
- C Japanese manufacturer
- E American manufacturer
- F Others

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

-26 -

(Place appropriate letters in the \* box)

Finally in this question could you comment on the range of sizes of machines:

-  
-  
-  
-

8b) Injection Moulding

Note) Use same groupings in origin as in extrusion.

|                         | Total numbers | Average age | Place of origin* |
|-------------------------|---------------|-------------|------------------|
| 0 - 50 tonne look m/c.  |               |             |                  |
| 50-500 " " "            |               |             |                  |
| over 500 tonne look m/c |               |             |                  |
| Specials                |               |             |                  |
| Total                   |               |             |                  |

Comments if any

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-  
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TEL. NO  
CABLE. EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P O BOX 1517 W H O ALEX

تليفون :  
تلفارضا : ايجيپلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب. ١٥١٧ : الصحة العاليه الاكسيه

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

STORIA - ALEXANDRIA

فيكتوريا - اлександريه

-27-

8d) Compounding

Note) Use same geographic grouping for origin.

Single screw machines  
Twin screw machines  
Special extruders  
High speed

| Total numbers | Average age | Place of origin* |
|---------------|-------------|------------------|
|               |             |                  |
|               |             |                  |
|               |             |                  |
|               |             |                  |

Comments if any

-  
-  
-  
-

8e) Thermoforming

Note) Use same groupings as in extrusion.

Web fed machines  
Sheet fed machines  
Others

| Total numbers | Average age | Place of origin* |
|---------------|-------------|------------------|
|               |             |                  |
|               |             |                  |
|               |             |                  |

Comments if any

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-  
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NO  
LE. EGYPLASTIC  
EX 54223 EGYPLAS UN  
BOX 1517 W H O. ALEX

تليفون  
تلفون فيا ايجي بلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب ١٥١٧ القبة العاليه اлександريه



مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 28 -

8g) Blow Moulding

Note) Use same geographic grouping for origin.

Up to one litre

1 - 5 litres

Above 5 litres

| Total Numbers | Average Age | Place of origin |
|---------------|-------------|-----------------|
|               |             |                 |
|               |             |                 |
|               |             |                 |

Comments:

-  
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TEL. NO  
CABLE EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P.O. BOX: 1517 W. H.O. ALEX

تليفون  
تلفزيون ايجيبيلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب ١٥١٧ الصحة العاليه الاكسيه

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

ICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 29 -

8f) Pressure moulding

Note) Use same geographic grouping for origin

Thermoset machines  
Thermoplastic machines.

| Total numbers | Average age | Place of origin |
|---------------|-------------|-----------------|
|               |             |                 |
|               |             |                 |

Comments:

-  
-  
-  
-

9) Staffing

We now want to look in outline only at your levels of staffing. The purpose here is to get just a simple outline of industry needs.

|                      | Total numbers |
|----------------------|---------------|
| Management           |               |
| Graduate technicians |               |
| Technicians          |               |
| Skilled workers      |               |
| Unskilled workers    |               |
| Totals               |               |

TEL. NO.  
TABLE. EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P.O. BOX 1517 W. H. O. ALEX

تليفون  
شماره فاكس : ٥٤٢٢٣  
ص.ب. ١٥١٧ الميناء الميناء الاسكندرية

مركز تنمية قطاع البلاستيك  
PLASTIC DEVELOPMENT CENTRE

VICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 30 -

9 cont.

Comments:

-  
-  
-

10) Business Constraints

Where do you see the most important areas of constraints to the growth and profitability of your business. Ask respondent to rank order.

- Market and new opportunities
- Equipment availability
- Lack of materials
- Government restrictions
- Quality and quantity of staff
- Loss of electricity
- Material quality problems

Please comment on these or other problems that you feel restrict your activities. Ask respondent to comment on the points he considers most important or least important.

Comments:

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TEL NO  
CABLE EGYPLASTIC  
TELEX 54223 EGYPLAS UN  
P O BOX 1517 W. H O. ALEX

تليفون :  
تلفزيونيا : ايجي بلاستيك  
تلکس : ٥٤٢٢٣  
ص.ب. ١٥١٧، الضفة الغربية لاسكندرية

مركز تنمية صناعات البترسيين  
PLASTIC DEVELOPMENT CENTRE

ICTORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 31 -

11) Where do you see your business expansion. (ask respondant to rank order)

- Growth of existing markets
- Diversification into other markets
- New applications
- Growth of the economy generally

Comment: (Probe these or any other areas and again ask for views on growth rates).

-  
-  
-  
-  
-  
-

12) Finally we would like to ask you what you feel is the role of the PDC in the industry. As the PDC plants its forward programme it must ensure that it does so with the industry's views in mind. Possible areas of assistance could be : (ask respondant to rank order)

- Assistance with industry standards.
- Training of industry staff
- Providing practical experience for under graduates before entering into industry.
- Representation of the industry's needs to Government.
- Promotion of seminars
- Providing testing services for industry
- Provision of pilot plant facilities for the smaller companies.

EL NO.  
ABLE: EGYPLASTIC  
ELEX 54223 EGYPLAS UN  
O BOX 1517 W H O. ALEX

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تلخون فيا، ايجيبلاستولت  
تلخون : ٥٤٢٢٣  
ص.ب. ١٥١٧، المحة العاليه الكسبه

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

STORIA - ALEXANDRIA

فيكتوريا - اлександريه

- 32 =

12 cont.

Comment (Please probe for comment on all or any of these points or other raised).

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ALE EGYPLASTIC  
EX 54223 EGYPLAS UN  
BOX. 1517 W. H. O. ALEX

تليفون  
تلفونها: ايجي بلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب ١٥١٧ المحة العاليه الاكسويه

مركز تنمية صناعات البلاستيك  
PLASTIC DEVELOPMENT CENTRE

ICTORIA - ALEXANDRIA

فيكتوريا - اлександريّة

-33-

GUIDING SHEET

- (A) Local Manufacturer
- (B) European manufacturer
- (C) Japanese manufacturer
- (D) American manufacturer
- (E) Others.

NO

EGYPLASTIC  
54223 EGYPLAS UN  
OX 1517 W H O. ALEX

تلفون :  
تلفارفا : ايجيپلاستيك  
تلكس : ٥٤٢٢٣  
ص.ب. ١٥١٧، الصحة العامة لالمنية

| COMPANY                          | CONSUMPTION POLYMERS (tons/year) |               |             |              |            |           |               |           |            |   |
|----------------------------------|----------------------------------|---------------|-------------|--------------|------------|-----------|---------------|-----------|------------|---|
|                                  | LDPE                             | HDPE          | PP          | PVC          | ABS        | PC        | PS            | ACRYLIC   | REINFORCED | OTHERS                                  |
| 1. SALT AND SODA CO.             | 800                              | 400           |             |              |            |           |               |           |            |   |
| 2. MIDDLE EAST PLASTICS CO.      | 1500                             | 4500          |             |              |            |           |               |           |            | 1500 thermo-<br>set PA+ 20<br>Hostaline |
| 3. EGYPTIAN PLASTICS CO.         | 180                              | 1200          | 200         | 60           |            |           | 2360          |           |            | EPS 3000                                |
| 4. INTERNATIONAL PLASTICS CO.    | 300                              | 100           |             |              |            |           | 50            |           |            |   |
| 5. EUREYA FILLING & PACKAGING CO | 100                              |               |             |              |            |           |               |           |            |   |
| 6. EL HALBAMY CO.                | 500                              | 1500          | 1000        | 500          |            |           | 1000          |           |            | Melamine 500<br>Phenol fo. 500          |
| 7. EL SHERIEF CO.                | 5000                             | 3000          | 3000        | 7500         | 300        | 2752      | 3000          |           |            | PET 300                                 |
| 8. PHAROE PLASTICS CO.           |                                  |               |             | 10,000       |            |           |               |           |            | Master batch<br>400                     |
| 9. MEDICAL PACKAGING CO          | 2820                             | 1500          | 150         | 100          | 100        | 10        | 2800          | 50        | 2          | PA 100<br>Acetal 100                    |
| 10. AZZA CO.                     | 500                              | 200           | 100         | 150          |            |           |               |           |            |   |
| 11. VARTA CO.                    | 2000<br>30% LLD                  |               |             |              |            |           | 400           |           |            |   |
| 12. BATA CO.                     |                                  |               |             | 20,000       |            |           |               |           |            |   |
| 13. MISE PETROLEUM CO.           |                                  | 700           |             |              |            |           |               |           |            |   |
| 14. EL SHANTI CO.                | 4000                             |               |             | 15,000       |            |           |               |           |            |   |
| 15. SALAF CO.                    |                                  |               |             | 70           |            |           |               |           |            |   |
| 16. NATIONAL PLASTICS CO.        | 10,000                           | 1750          | 420         | 2500         |            |           | 400           |           |            | 100                                     |
| 17. PLASTICS PIPES AND PRODUCTS  |                                  |               |             | 10,000       |            |           |               |           |            |   |
| 18. HARBAK PLASTICS              |                                  |               |             | 1500         |            |           |               |           |            |   |
| <b>TOTAL</b>                     | <b>27,700</b>                    | <b>14,850</b> | <b>4870</b> | <b>67380</b> | <b>400</b> | <b>85</b> | <b>10,000</b> | <b>50</b> | <b>2</b>   | <b>6520</b>                             |

## MACHINES

| COMPANY                           | INJECTION                           |               | EXTRUSION                           |         | BLOW MOULDING |       | THERMO FORMING |     | COMPOUNDING |     | COMPRESSION |        | MIXERS   |     |
|-----------------------------------|-------------------------------------|---------------|-------------------------------------|---------|---------------|-------|----------------|-----|-------------|-----|-------------|--------|----------|-----|
|                                   | NO.                                 | AGE           | NO.                                 | AGE     | NO.           | AGE   | NO.            | AGE | NO.         | AGE | NO.         | AGE    | NO.      | AGE |
| 1. SALT AND SODA CO.              | 1                                   | 4             |                                     |         | 2             | 4 & 8 |                |     |             |     |             |        |          |     |
| 2. MIDDLE EAST PLASTICS CO.       | 18                                  | 4 - 15        |                                     |         |               |       |                |     |             |     |             |        |          |     |
| 3. EGYPTIAN PLASTICS CO.          | 20                                  |               | 4                                   | 10      | 8             | 8 - 3 | 3              | 6   |             |     | 12          | 2 - 15 |          |     |
| 4. INTERNATIONAL PLASTICS CO.     | 4                                   | 2             |                                     |         | 2             | 2     |                |     |             |     |             |        |          |     |
| 5. AMERIA FILLING & PACKAGING CO. |                                     |               |                                     |         |               |       |                |     |             |     |             |        |          |     |
| 6. EL HALBANY PLASTICS CO.        | 50                                  | 4 - 5         |                                     |         | 9             | 2 - 3 |                |     |             |     |             |        |          |     |
| 7. EL SHERIEF CO.                 |                                     |               |                                     |         |               |       |                |     |             |     |             |        | 4 mixers |     |
| 8. PHAROE PLASTICS CO.            |                                     |               | 3                                   |         |               |       |                |     |             |     |             |        | 5        | 5   |
| 9. MEDICAL PACKAGING CO.          | 61                                  | 5 - 10        | 9                                   | 7       | 6             | 20    |                |     |             |     |             |        |          |     |
| 10. AZZA CO.                      | 1                                   | 11            | 6                                   | 1-20    |               | 6     |                |     |             |     |             |        |          |     |
| 11. VARTA CO.                     |                                     |               | 3                                   | 2-10    |               |       | 1              | 2   |             |     |             |        |          |     |
| 12. DATA CO.                      |                                     |               |                                     |         |               |       |                |     |             |     |             |        |          |     |
| 13. MISR PETROLEUM CO.            |                                     |               |                                     |         |               |       |                |     |             |     |             |        |          |     |
| 14. EL SHANTI                     |                                     |               |                                     |         |               |       |                |     |             |     |             |        | 4        |     |
| 15. ZALAT CO.                     | 2                                   | 2             |                                     |         |               |       |                |     |             |     |             |        |          |     |
| 16. NATIONAL PLASTICS CO.         | 10 (0-50)<br>8 (50-500)<br>5 (7500) | 10<br>10<br>3 | 15 (single screw)<br>2 (twin screw) | 10<br>2 |               |       |                |     |             |     |             |        | 2        |     |
| 17. PPP                           |                                     |               |                                     |         |               |       |                |     |             |     |             |        | 5        |     |
| 18. KARNAK PLASTICS               |                                     |               |                                     |         |               |       |                |     |             |     |             |        | 1        |     |
| TOTAL                             | 181                                 |               | 44                                  |         | 26            |       | 3              |     |             |     | 12          |        | 21       |     |



TABLE III

| COMPANY                           | PROCESSES |           |               |               |             |             |                        |
|-----------------------------------|-----------|-----------|---------------|---------------|-------------|-------------|------------------------|
|                                   | INJECTION | EXTRUSION | BLOW MOULDING | THERMOFORMING | COMPOUNDING | COMPRESSION | OTHERS                 |
| 1. SALT AND SODA CO.              | /         |           | /             |               |             |             |                        |
| 2. MIDDLE EAST PLASTICS CO.       | /         | /         |               |               |             | /           |                        |
| 3. EGYPTIAN PLASTICS CO.          | //        | /         | /             | /             |             | /           | Calendring             |
| 4. INTERNATIONAL PLASTICS CO.     | /         |           | /             |               |             |             |                        |
| 5. AMREYA FILLING & PACKAGING CO. |           | /         |               |               |             |             |                        |
| 6. EL HALBANY PLASTICS CO.        | /         |           | /             |               |             | /           |                        |
| 7. EL SHERIEF CO.                 | /         | /         | /             | /             | /           | /           | Mats and mono-filament |
| 8. PHAROE PLASTICS CO.            |           |           |               |               | /           |             |                        |
| 9. MEDICAL PACKAGING CO.          | /         | /         | /             | /             |             | /           | Inj. blow moulding     |
| 10. AZZA CO.                      | /         | /         | /             |               |             |             |                        |
| 11. VARTA CO.                     |           | /         |               | /             |             |             |                        |
| 12. BATA CO.                      | /         |           |               |               | /           |             |                        |
| 13. MISR PETROLEUM CO.            |           |           | /             |               |             |             |                        |
| 14. EL SHANTI                     | /         | /         |               |               | /           |             |                        |
| 15. ZALAT CO.                     | /         |           |               |               |             |             |                        |
| 16. NATIONAL PLASTICS CO.         | /         | /         | /             |               | /           | /           |                        |
| 17. PPP                           |           | /         |               |               |             |             |                        |
| <b>TOTAL</b>                      | 12        | 10        | 9             | 4             | 6           | 6           | 4                      |

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Appendix (5)

EXTRUSION TRAINING SESSION

Sunday April 20th to Wednesday April 24th 1985 inclusive

Day 1

Assemble PDC 10 am.

The Centre, its objective

Tour of the facility

Disperse 2.00 pm.

Day 2

Assemble 9.00

Lecture. The principle of screw plasticization

Identification of materials. Including demonstration

Differentiation of grades " "

Disperse 2.00 pm.

Day 3

Assemble 9.00 am.

Demonstrations on the extruder including material changes the effect of linear Polymer or die pressures etc.

Disperse 2.00 pm.

Day 4

Assemble 9.00 am.

Further demonstrations including screw changes and instruction as running the machine.

Disperse 2.00 pm.

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ALEXANDRIA

فيكونيا - اлександريه

Day 5

|                     |               |
|---------------------|---------------|
| Assemble            | 10.00am.      |
| General discussions | 10.00 - 12.00 |
| Disperse            | 12.00 am.     |

THE FUNDAMENTALS OF PLASTICS  
PROCESSING

Today we are going to discuss the processing of plastics in a general sense. We shall specifically cover the subject of extrusion as one of the main processes but first I would like to draw out some points in relation to the materials themselves and then to examine extrusion along with the other processes used in the conversion industry.

As you know from your material studies plastics materials fall into two main classifications from a processing point of view :-

- Thermoplastics
- Thermosets

Thermoplastic materials can broadly be defined as those materials which can be reused and reprocessed over and over again within the limitations of thermal stability of the particular polymer. Thermosets on the other hand can be viewed as material falling half way between the monomeric materials from which they are made and the final product which they become. During forming and shaping of these materials under the influence of heat and pressure polymerization is continued and the final article is cross linked to form a polymer matrix no longer susceptible to further heat softening and repeated processing.

The commonest thermoplastics are polyethylene, polypropylene, polystyrene and PVC. These are known as commodity resins in the trade. The first two are based on olefinic chains formed from polymerization of ethylene and propylene respectively, the third is based on polymerization of styrene a basic benzene ring with an attached acetylenic structure while the fourth PVC, derives from a chlorine modified acetylene. The range of other materials available to the processor is too long to be described in one lecture but some examples are 'ABS (acrylonitrile butadiene styrene) SAN (styrene acrylonitrile), polyethers, polyesters, polysulphones, polycarbonate, etc.

etc. Almost every year a new polymer puts in an appearance. One of the most recent additions is linear low density polyethylene. Even this represents a family of materials rather than an isolated single resin.

Recent years have seen advances in polymer technology unparalleled in the early days of the industry. The advent of polymer alloy processes has enabled the producer to begin to engineer the end properties of the polymeric material to the requirements of the application in much the same way as the steel makers and other metal producers did at the beginning of the century, in their industry. Examples of such materials are general electrics noryl (comprising an alloy of polystyrene and polypropylene oxide which finds wide use in the electrical and electronics industries and bay blend an alloy of ABS and polycarbonate which is making strides in the automotive industry. Others include alloys based on PVC and chlorinated polyethylene and alloys of polypropylene and thermoplastic rubbers. All those products have been developed to satisfy particular market demands and the number and complexity will grow as industry becomes even more demanding of its suppliers.

Coupled with its increasing range of materials is the need for even tighter and more extensive control of the processing machinery to enable the industry to cope with a wide range of materials and applications. That has in recent years lead to extensive automation and computer controls on processing machinery. Thermosetting materials on the other hand have changed little over the years. The main materials in this area are Urea formaldehyde, melamine formaldehyde and phenol formaldehyde. These are still processed in the main on simple heated platten compression presses which shape and complete the polymerization process in a single operation. In recent years some advances have been made and automatic injection moulding machines specially designed to handle these materials are available. Their use is by no means universal and they are only suitable for non decorated applications.

If we now consider the main processes used in converting thermoplastics polymeric materials from their original powder to pelet or to articles which we have come to recognise and use, the two main groups are :-

Extrusion

Injection

secondary processors are :-

Thermoforming

Blow moulding

and these are followed by a whole host of others used for specific purposes. Examples of these are injection reaction moulding, injection blow moulding and multilayers extrusion. Turning our attention to the main processes, let us consider the objective which an extrusion or injection moulding machine sets out to achieve.

The processing equipment is required to take the powdered or pellet plastic, plasticise or melt it, convey it in a liquid form to a mould or die, where it can cool again to a solid form in the shape required by the end user, either as an end product or as an intermediary for further processing.

In almost every case in modern machines the heart of any piece of equipment designed to achieve this objective is a screw. It is therefore of the utmost importance to understand clearly the function and mechanism by which screws achieve this objective. Even amongst process operators and technologists in the industry there is far too much misunderstanding and mystic in this area. The simple archmedian screw has been known for thousands of years for conveying material in a continuous fashion from one place to another and finds application in a wide range of industries. It comprises a screw cut from a piece of material, wood, stone, or metal, turning in a tube which conveys material along the length of the tube as the screw rotates. The heart of extruders and injection moulding machines is no more than a modified form of this simple pumping mechanism.

The screw in a plastic processing machine carries out four main functions :-

- 1) It conveys the material from the feed hopper to the exit of the machine.
- 2) It applies shear energy to achieve plastic melting of the polymer.
- 3) It causes turbulence in the melt to ensure homogeneity of the product during shaping.
- 4) It compresses the material to high pressure so as to make it flow evenly out of the orifices of the machine. Pressures of 2-6000 lbs/sq inch are the normal.

The study and design of screws is a very complex technology which even today, after extensive computer study is still part science and part art. Nevertheless there are certain myths concerning this technology that I wish to lay to rest. The most important of these, is the belief that the screw conveys whilst the heaters heat. Between 70-90 % of all energy imparted to the polymer during melting derives from shear energy not from the heaters and in fact some extruders known as adiabatic extruders are designed to operate without heaters at all. Most screws comprise three main sections:

- The feed zone where the flight depth is uniform and relatively deep.
- The compression zone where the flight depth decreases continuously.
- The metering zone which again has a constant flight depth but is much more shallow than the feed zone.

There are other shapes and additions to the simple screw geometry as well as multi screw machines ranging from two to six screws operating in a single barrel but we shall only touch on those when we have considered the mechanism by which a single screw operates. The first or feed section of the screw serves only to convey the pellet or powder into the cylinder or barrel and it is as well to understand the mechanism by which this takes place. The material has higher friction against the stationary barrel than against the moving screw and anything which serves to diminish this difference causes slip and inefficiency in the feeding process. To aid this most injection and extrusion machines have water cooled hoppers to avoid early melting from shear energy which would give rise to slip and poor feeding. Other devices such as grooves in the early part of the barrel and part water cooling of the screw to the centre are increasingly being used to maximise the effectiveness of the conveying mechanism for a given screw diameter. The old method of using deeper flights has been shown to be ineffective for this purpose as well weakening the mechanical strength of the screw. Except in special cases of low bulk density material such as foam scrap this technique has been discarded.

The second or compression zone is where most of the melting takes place. Here the material is subjected to high shear and confined to an increasing smaller volume. To illustrate the fact that

most of the energy comes from shear and not the heaters, it is not uncommon to find the actual barrel temperature higher than the set temperature (known as overriding) due to shear energy being conducted from the melt outwards and showing on the thermo couple as excess temperature. Various forms of water and air cooling are employed in many machines to overcome this phenomena and sustain the forward motion of product. In extreme cases it can cause degradation of the product and this is often cured by raising the barrel temperature and achieving a consequent decrease in melt temperature. Control of the melt temperature is the critical factor not control of the barrel.

The thing that has to be considered always is that screw serves as a pump to carry the material forwards. This is the simplest form of screw to which can be added a whole range of additional parts for different purposes. In extruders reverse flights, gears rings and other devices are often attached to the end to achieve high turbulence and mixing of polymers and pigment. Sometimes two units of complete screw are added end to end so as to cause a decompression at the mid point of the barrel enabling a hole to be made in it to extract volatiles from the material. In older designs not only did the flight depth vary but also the pitch to achieve different flow patterns. The variations are almost infinite and far too expensive to consider today.

We would briefly touch on other special configurations of which the most important is the continuously decreasing flight depth screw used for the processing of PVC. This material is the most unstable of all the commodity polymers and requires special treatment, the key to success in processing PVC lies making sure that the swept volume or cross sectional area of the path of the material, constantly decreases throughout the process. Imagine a conical hose pipe about 20 meters long with constantly decreasing volume.

If you were to fill flights of a PVC screw with plasticine or wax take it out and straighten it, would resemble the conical hose. The objective is to ensure that there is no place where the PVC can remain stagnant and decompose. This type of screw is not the most



efficient but it is necessary for this unstable product. Twin screw machines which are more efficient are often employed to process PVC but they bring with them complex mechanical design problems particularly in the thrust bearings in the gear box because while the screw itself is pushing material the simple principles of the machines... implies the screw has an equal and opposite force trying to push it into the gear box. Hence, the need for the substantial thrust bearings.

In injection moulding the main addition is that of a valve at the end of the screw and a mechanism to enable the whole screw to oscillate backwards and forwards in the barrel. The screw then operates in an intermittent fashion. It turns, conveys material forward through the valve into a storage reservoir at the end of barrel while at the same time it moves back as a result of the pressure generated in this storage space. (This is known as the screw back time of the cycle). Once the reservoir is full a pressure device stops the screw turning. A hydraulic mechanism then forces the screw forward when it acts as a simple ram pump to inject the molten polymer into the waiting mould cavity and form the product.

Having examined the function of the screw and its vital part in plastics processing let us look at the remaining part of the wide variety of equipment which is attached to the barrel end. First, extrusion, the semi liquid viscous mass can be conveyed through a wide variety of dies. The simple round pipe die followed by a water bath where ancillary devices serve to shape and contain the material whilst it sets is perhaps the easiest to understand. The polyethylene film die comprises no more than a similar circular orifice through which the material is extruded. After this air is introduced through a specially designed die, expands the size of the bubble and produces a thin pipe known as film. Of course other properties are introduced into the film by this expansion these are stretching and cooling process but they are a result of characteristics already inherent in the polymer molecule. To illustrate this take an example simple chemistry. If you melt sulphur and cool, the properties of the product you get depends on how you cool it. Rapid cooling will provide an amorphous soft material, slow cooling gives a crystalline product. Polymers are in some senses similar, and the method of cooling affects the crystalline orientation and properties.

Another extrusion process is that of sheet, here a die designed to emit the semi molten mass through a narrow slit on to a cooled roller producing a sheet of material suitable for further processing by for instance thermoforming. The possibilities are almost endless.

In injection moulding the melt is forced through a nozzle into channels and then into a cooled mould in an intermittant sequence during which the mould opens and closes to eject the solid part. A series of cores or pins are often mechanically inserted into the mould during closing and withdrawn during opening so as to produce a complex of shapes to serve the end use required. These range in size from the small spray cap on the common aerosol to the complex crate used for conveying soft drinks. The mechanism is the same. We should perhaps mention the two main parameters of injection machines which are :-

#### The Shot Weight

#### The locking force

The shot weight describes the amount of material that can be injected at one time and can range from 100 gms. to 10 kilos dependant on the purpose for which the machine is designed. This 100 gms. say is not an actual weight but a 100gm. machine can be made to produce the maximum part of a 100gms with general purpose polystyrene. Other polymers will be less.

The locking force is the maximum force that can be applied to keep the plates together. Remember that when the molten polymer is injected into the mould at 4-6000 pounds per square inch the liquid creates a hydraulic pressure against the two halves of the mould and tries to open it. There are well known methods for calculating what is known as the projected area of a moulding from which a suitable machine can be selected for a particular product. The locking force must in general exceed the projected area times the injection pressure.

Finally the injection mould contains water cooled channels which serve to take away the heat and set the material to shape. The control of these and the use of chilled water largely governs the speed with which the machine can be made to cycle as cooling is the largest part of the cycle.

The blow moulding process combines some elements of extrusion with some parts of injection. The material is extruded in a pipe at such a speed as to produce a fixed length of hot polymer pipe in a fixed time span. The pipe is then gripped in a mould, cut off, air is injected at the top whilst the bottom of the tube is pinched closed, and the tube is then expanded by the air to fill the shape of the mould and cooled. Meanwhile the extruder goes on producing the next piece of pipe, or parison as it known, ready for the next cycle. The process is capable of producing containers ranging from as little a 20mls. up to 200 litres with applications ranging from specialized pharmaceutical packs to heavy chemicals drums. This process is perhaps one of the simplest to control. But the key is again cooling rate. Thermoforming is a secondary process which starts from a previously extruded sheet. The material is gripped at the edges either in a frame one sheet at a time, or between chains off a roll and fed under heaters. When soft it is moved to the mould position and forced to take up the shape of the mould. This is done either by drawing a vacuum and sucking the soft material down to the shape of the mould or by a male and female mould. There are a wide range of intermediate procedures depending on the product. The commonest is known as the plug assist technique. This finds application where the depth to diameter ratio of product is high and simple vacuum techniques do not give adequate distribution of the material a common example of this is a cup where this process of plug assist is used. The articles then need to be removed from the sheet in which they have been formed. Roller cutting and stamping are two commonest methods and products produced by this process range from simple pack such as are used in the hotel breakfast for marmalade to the total internal liner for a refrigerator. I do not propose to explain further the other processes which I mentioned at the beginning of this talk, suffice it to say that each is a specifically tailored method of producing a shape or article for a particular end use. A few examples of the process are slush moulding for the production of bottles and toys for children. Rotational moulding for large furniture components and reaction injection moulding for reinforced automotive parts. Finally I propose to treat in outline the question of additives which are used in processing of polymeric material. These fall mainly into two groups:

- Material designed to assist in using plastics eg. to depress decomposition or otherwise modify the character of the melt.
- Material designed to add some special property to the finished product.

Material designed to assist the processor vary with the polymer. For polyolefins i.e. polyethylene and polypropylene these primarily consist of antioxidants, slip additives or antiblocking additives. In Europe these are generally incorporated by the polymer producer although practices vary considerably between Europe, USA and other parts of the world. In polystyrene you need not concern yourselves generally speaking no processing additives are required. Such as are used, those required to produce a range of softening points are added in the polymerization process. It is in the PVC where the skill of the compounder comes into play. Formulations are many and varied and influenced not only by technical requirements of the process by also by the end use applications. For example the selection of stabilizers is important. Lead stabilizers although the best are totally unsuitable for food applications, tin stabilizers are the only real answer in these end uses. In addition to the stabilizer, process aids are also widely used. These comprise complex acrylic resins, methyl styrenes and other products which change the shear characteristics of plastised melt and influence its flow behaviour. Other products such as epoxidised soya bean oil have an influence on the behaviour of the material. This subject needs quite separate treatment and could easily form content of a separate two or three day dissertation. There are many published papers on this subject and a paper which I once published on some research into Barium/cadmium/calcium systems gives a wide range of references.

If we now turn to the materials which impart some special property to the finished product again the diversity is wide to quote but a few examples. Ultraviolet stabilising additives are used in agricultural film. Tinuvin is an example, flame retardant materials are used in polyolefins these are often based on Brominated Hydrocarbons and are used to conform to safety standards in say television cabinets.

Antistatic materials are added to polystyrenes to prevent unsightly patterns of dust on display articles. Anti blocking additives are added to polyethylene film polymer to prevent print sticking when the product is reeled up. Chlorinated polyethylene is used in PVC formulations for the production of window frames to prevent what is known as chalking or loss of gloss. Aluminum powder is often added to the shrink wrap covers used for packaging pellets of fertilizers to reduce infra red penetration and retard degradation in nitrates.

The list is very extensive all I have tried to do is give a few examples. Finally let me thank you for listening, I make no apology for reading most of this lecture rather than giving it in an "ad hoc" fashion, my purpose was to provide as complete a record as possible so that those of you whose English comprehension is not as good as you would like it to be, you will have an opportunity of reading the paper at a more leisurely pace and studying those parts which are of particular interest to you.

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PVC COMPOUNDING

PVC Compound for Sale

Only five significant PVC compounders have been identified and from the replies given by users of the material, within the areas broadly defined by Alexandria and Cairo it is unlikely that there are any others of significance. The known extensive use of land drainage pipe suggests that there may be one or two more outside these areas in Ismailia, Upper Egypt or the Red Sea regions and this possibility cannot be dismissed.

The companies identified are as follows :-

1) AL SHERIEF PLASTICS FACTORIES (PRIVATE SECTOR)

Cairo office : 24 Abu Simbel st. Heliopolis, Cairo.

Tel. Cairo: 691090 - 871475 - 868305 - 872327 - 867190 - 873308

Telex : 93674 - 22993 SHRF UN

Contacts : Mr. Mahmoud Abdel Aziz Bishr, Planning and Pursurance Dir.

Mr. Moustafa Darweesh, Projects Department

Mr. Mohi El Din Anwar Hassan, Manager Factories and  
Technical Affairs.

Factories are located at Heliopolis and 10th Ramadan City. There is a move to locate all production at 10th Ramadan City in a new industrial zone but this change has only come about since the last visit in 1982.

Cairo factory: Ismailia Highway - tel. 944265

All first contact is channeled through the Cairo office and decision making very much in the hands of the Chairman El Sherief himself.

Equipment comprises high speed mixers (Henschel's ?) and twin screw extruders, (Cincinatti) in all three or four lines. Annual consumption is reported to be in excess of 5000 tonnes but the actual figures is probably nearer 10,000 tpa. Some material is used internally and sales of compound are probably in the 5 - 7000 tpa region and predominantly

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flexible, including specialist cable compounds. Although El Sherief is probably the biggest plastic company in Egypt it is probably not the biggest compound producer. (total plastic consumption 20-30,000 tpa).

2) EL SHANTI GROUP (PRIVATE SECTOR)

Cairo Office : 79 Marghani st., Heliopolis, Cairo

Telex: 92671 SHANTI UN

Contacts: Mr. Moustaf Shabaan, Director of Planning and Progressing  
Mr. Ahmed El Shanti,

Factory: 10th of Ramadan City

Tel. Ismailia Central 242627

Equipment comprises four lines of mixed origin with high speed mixers and extruders. Internal consumption is in the region of 5000 tpa mainly for shoes, sales of around 10,000 tpa are like El Sherief predominantly in flexible and include cable compound. Total consumption of all plastics is in the region of 20,000 tpa. The company background lies outside Egypt with Lebanese connections.

3) PHAROEPLAST CO. (PRIVATE SECTOR)

Cairo Office : 439 El Ahram Ave., Giza.

Tel.: 853172 - 852350

Contacts: Mr. Hussein El Kashouti, Chairman  
Mr. Fathy El Kholy, Commercial Manager

Factory located at Mohawelat Rd., Giza Industrial Estate, 27 KM  
(Near Toll station on desert road).

The equipment comprises five German single screw extruders with high speed mixers from TK Fielder and one Banbury mixer. Output is 10,000 tpa of PVC compound, 60 -70 % flexible for supply to cable and shoe industries and some pipe produce. This company also produces 400 tpa

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TELEX: 54223 EGYPLAS UN

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ص. ب. ١٥١٧ القبة العامة لالكتبة

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of masterbatches some for polyolefin. It does not engage in any other activity. Master batch imports are reported to be banned so there must be other producers.

4) MISR EL HEGAZ COMPANY ( PRIVATE SECTOR)

Cairo office: 198 El Hegaz st., Heliopolis, Cairo

Tel.: 44416 - 444424 - 444434

Contacts: None

Factory: 10th of Ramadan City, Industiral Estate Al

Tel. (015) 21858

Nothing is known about the output or equipment of this factory but it does supply cable and shoe compounds and is reported to be of significant size. (Egyptian Petrochemicals estimates the output at 10,000 tpa).

5) SHERIE PLAST (PRIVATE SECTOR)

The 16.5 KM. Kalube, Tel. 956945

No contact has been made with this company but again it is quoted as a supplier to the cable and shoe industries.

PVC DRY BLEND AND COMPOUND FOR INTERNAL USE

1) PLASTICS PRODUCTS AND PIPES COMPANY (PRIVATE SECTOR)

Cairo office: 11 El Nasr st. , Nasr City, P.O. Box 8149, Cairo.

Tel.: 606591 - 606394

Telex: 93856

Factory: 10th of Ramadan City, Industrial Estate

Contact: Mr. Bob Lomas, Works Manager (Ex. Wavin U.K.)

This company converts 10,000 tpa of PVC into rigid pipes up to one meter diameter, has a recently installed automate dry blending plant and size to eight extrusion lines (mostly Cincinnati and Reifenhauer).

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No compounding is done. The owners have factories in other Arab States including Saudi Arabia.

2) NATIONAL PLASTICS COMPANY (PUBLIC SECTOR)

Cairo office: 15 Emad El Din st., Cairo  
Telex: 92774 NAPEO UN  
Tel.: 914315 - 914500  
Factories: Omranieh, Giza, Cairo - Tel. 851128 - 852399  
Shoubra El Khema, Cairo - Tel. 948633  
Mina El Basal, Sheikh Bishri st. Alex. - Tel. 26366  
Contacts: Mr. Hamed El Sharkawy, Chairman  
Mr. Ibrahiem Arafa Ibrahiem, General Manager Cairo  
Factory

This company consumes 2000 tonnes of PVC in pipe manufacture direct from dry blend mainly small sized pipes. Equipment is high speed mixers (origin unknown).

3) KARNAK PLAST COMPANY (PUBLIC SECTOR)

Office: Toril st., Ras El Soda, Alexandria.  
Contact: Mohamed Tawfik

Equipped with a single Papermeix high speed mixer and one extruder this company produces 1500 tpa of 4" and 6" rigid pipes. Plans are in hand to purchase two additional lines and manufacture fittings for which a Nissei injection machine is on site.

4) BATA CO. (PUBLIC SECTOR)

Office: 61 El Ekhshidi st., El Kabbari, Alexandria  
Tel. : 32790 - 24640

Consumption is around 20,000 tpa all as flexible direct from dry.

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blend for shoe production. High speed mixers are used but number and origin are unknown.

SUMMARY OF PVC CONSUMPTION :

Total identified consumption of PVC in Egypt at the present time amounts to 67,000 tonnes. Estimated total of take is in the region of 100 - 150,000 tonnes of which one third to one half is compounded and the remainder fed directly from dry blend. Limited quantities of compound are imported direct by some of the smaller users such as Bakir Plastics. The total consumption figure should be treated with caution and may well prove to be an under estimate. Growth rates are reported to be in the region of 10 - 15% with an emphasis on pipe production. The equipment employed in the industry is mostly of European origin. Henschler, T.K. Fielder and Papermeir are the main mixers suppliers and Cincinatti Milacron dominates the modern extruders. The resin is obtained variously from Europe with an element of Eastern supply, there is no evidence of the USA having any real market share. Grade requirements are mainly for rigid pipe, shoe material, cable grades and small quantities of bottle material for packaging. Emulsion grades are also employed in leather cloth production but are not included in these estimates.

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تلخون : 54223  
ص.ب. 1517 الصفة العامة الاكسرية

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OTHER COMPOUNDING IN EGYPT

Although there is clear evidence of the use of master batch in Egypt and imported material is reported to be banned, there is no evidence of any significant compounding industry in Polyolefins and polystyrene comparable to European scene.

Injection moulders, the most likely outlet for compounded material extensively use dry powder methods and show no indication to change. This situation needs through check and can most easily be done through the main pigment suppliers to Egypt, like Giba Geigy and Sandoz.

Compounding of engineering and specialised polymeric materials in Egypt is virtually non existant as no significant quantities of these materials are used. The industries such as automotive where these products are generally seen, still import piece parts such as bumper bars complete. The growth of a compounding industry in this field will be dependant on local manufacture of the parts.

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P O BOX 1517 W H O. ALEX

تليفون  
تلفزيونيا: ايجيپلاستيك  
تلكس: ٥٤٢٢٣  
ص.ب. ١٥١٧ الصفة العامة لالمنية

(Appendix 9)

1. NATIONAL PLASTICS CO. (PUBLIC SECTOR)

Address: 15 Emad El Din str., Cairo (Office)  
Omranehya Giza  
Shoubra El Khema  
Mina El Basl, Sheikh Bishri str. (Alexandria)  
Telex: 92774 NAPCO UN  
Tel.: 852399  
Contact: Chairman : Chem. Hamed El Sharkawy  
Plant Manager: Eng. Ibrahiem Araffa

2. PLASTICS PRODUCTS AND PIPES CO. (PRIVATE SECTOR)

; Address: 11 El Nasr str., Nasr City, Cairo  
10th of Ramadan City (factories)  
Telex: 93856 PPP UN  
Tel.: 606591 - 606394  
Contact: Works Manager : Mr. Bob Lomas

3. SHANTI GROUP CO. (PRIVATE SECTOR)

Address: 79 Merghani str., Heliopolis  
10th of Ramadan City (factories)  
Telex : 92671 SHANTI UN  
; Tel.: 24 - 26 - 27 Ismailia Central  
Contact: Mr. Ahmed El Shanti

4. BAKIR PLASTICS (PRIVATE SECTOR)

Address: Miet Halfa Kalube - P.O. Box 1349  
Telex:  
Tel. : 758126 - 956244  
Contact: Eng. Hekmat Bakir - Eng. Ahmed Bakir

5. EL SHERIEF PLASTICS FACTORIES (PRIVATE SECTOR)

Address: 24 Abu Simbel str, Heliopolis (office)  
Cairo-Ismilia High way (factories)

Telex: 22993 SHRF UN 93674

Tel.: 373308 - 871475

Contact: Eng. Mohyi Anwar Hassan (Manager Factories and Technical  
Affairs)

Mr. Mohamed Abdel Aziz Bishr (Planning and Pursuance Director)

6. ABDALLAH HELMY CO. FOR PLASTICS (PRIVATE SECTOR)

Address: 1 Mazloun str., Bab El Louk, Cairo  
Factories , Abu Rawash

Tel.: 748738

7. ESLON MISR (PRIVATE SECTOR)

Address: 28 Talaat Harb str.

Tel. 768575 - 745813

Contact: Eng. Osama Hehazei

Sales Management Section

34 Kasr El Nil str., 8th floor, CAIRO

P.O. Box 1183 - 11511 Cairo

Tel. 744572 - 754543

8. FATHI EL SAYED FACTORY FOR CABLES AND PIPES (PRIVATE SECTOR)

Address: El Tabya El Bahareya, Boulak El Dakrour, Giza

9. HACK PLASTICS (PRIVATE SECTOR)

Address: Abu Rawash, Giza

Tel.: 748738

10. THE EGYPTIAN PLASTICS INDUSTRIES AND ELECTRICITY CO. (PUBLIC SECTOR)

Address: 15 Ibn Okeil str. Victoria, Alexandria

Telex: 54223 EGYPLAS UN

Tel.

Contact: Chairman: Dr. Farouk Garrana

11. EL NASR COMPANY FOR ARTIFICIAL WOOD AND RESIN (

Address: Sandoub, Mansoura, Dakahleya.

P.O. Box 79 Mansoura.

12. ABU YOUSSEF FACTORY FOR PLASTICS

Address: 82 EL Khaleig El Masry str.,

Hadiak El Kouba, Cairo.

13. BARZY BROTHERS FOR PLASTICS AND COMMERCIAL AGENCIES

Address:

14. MOHAMED KHALIL SONS FOR PLASTICS

Address: 6 El Darb El Ahmar, Gammalieh, Cairo

15. EL AHRAM FOR PLASTICS MANUFACTURING

Address: Sabry El Zher Str.

2 A Zaki Bek Kassem, El Azhar, Cairo

16. EIVA CONTRO FOR PLASTICS

Address: 67 Kamel Sidki, Faggala, Cairo

17. PLASTOPLEX COMPANY

29 Sherief str. , Cairo

Factory: 705 Port Saeed str., El Waili

18. PLASTICS AND LATEX COMPANY

Address: 3 El Haiesh str., Shoubra

19. PORT SAEID PLASTICS FACTORY

Address: Industrial Zone El Basateen, Cairo

20. SAMIR PLASTICS FACTORY

Address: 2 El Mahdy street zone, Azbakeya, Cairo  
Industrial zone, El Basateen, class 113

21. GIGI PLASTICS FACTORY

Address: 1 SAADALLAH Str. El Darb El Ahmar

22. ROYAL PLASTICS FACTORY

Address: 114 Sharket El Petrol str., Sharabiah, Cairo

23. GAAFAR PLASTICS FACTORY

Address: Madraset Rokey El Maaref str., Sharabia, Cairo

24. GOLDEN EAGLE PLASTICS FACTORY

Address: 47th str., Industry Zone, Abbasia, Cairo

25. NILE PLASTICS FACTORY

Address: 6 Ali El Torgoman str., Boulak, Cairo

26. MIDDLE DELTA PLASTICS

Address: 7 Zaraf str. Rood El Farag, Cairo

27. HELBAWY PLASTICS

Address: 993 Cornish El Nil, Cairo

Factory : Industrial Area El Basateen, Cairo

28. NATIONAL PLASTICS PRODUCTS CO.

Address: 22 Japanese Co. street, Sharabeiah, Cairo

29. ROMANY PLASTICS CO.

Address: 2 Marakeish str., Ragheb Basha, Alexandria

30. ORIENTAL PLASTICS PRODUCTS FACTORY

Address: Nemat Mokhtar str., El Hadara, Alex.

31. THE TECHNICAL COMPANY FOR PLASTICS

Address: 277 from Zaki Naguib, Semouha, Alexandria

32. HELAL PLASTICS ALEXANDRIA

Address: 132 Bacous, El Souk Station, Ramel, Alexandria

33. BABICO PLASTICS, COMMERCIAL AND FABRICATING

Maehad El Moalemeen str., Railway Housing, Coom Hamada,  
Behera.

34. PLASTICS ORIENT COMPANY

Address. Afifi str., from Moustafa El Shahed str.  
Aguza, Cairo

35. WALTER EGYPT

Address: El Ras El Souda, From Moustaf Kamel, Victoria

36. VERTA PAPER CO.

Address: 42 El Souk Str., Bacous Alexandria.

Tel. 61938 - 60939

Contact: Chemist Hosam Ahmed Sellow

Chairman: Chem. Farouk El Faran

37. EL AMREYA CO. FOR PACKAGING

Address: Part No. (10, Block 30, El Amreya, Alex.

Contact: Mr. Saleh Abdel Aziz Ismail

38. HAMED MOUSSA FACTORIES

Address: 172 Mohamed Ali str., Cairo

Tel.: 930942 - 901508 , Cairo

21944, Alex.

25368, Tanta

28046, ASSUIT



39. ZALAT CO FOR SHOES (MOHAMED ZALAT AND CO/

Address: KM 28, Cairo/Alex. Desert Road

Talaat Harb str.

Tel. : 671844 - 671534

Telex. 92985 MDHTL UN

40. EL BARADIE PLASTICS FACTORY (B.P.)

Address: P.O. Box 2444 Alex.

Contact: Chem. Omar El Baradie

Tel.: 964488

Telex: 54304 MANX UN

41. UNION CARBIDE MIDDLE EAST LTD/

7 Lazoughly str., Isis building, Apt.9

Garden City, Cairo

Tel. 23957 - 25685

Telex. 92401 UCMEL UN

Mr. L.J. Couvaras

42. ARAB MEDICAL PACKAGING CO.

Address: 47th street, Industrial zone, Abbasiah, Cairo

Tel. 836144 - 836046 - 836235

Telex. 92931 HAPY UN

Contact: Chairman Mr. Gamal El Din Ghaley

43. SHERIE PLASTICS

Address: 16.5 KM, Kalube

Tel. 956945

44. SLAB FOR SHOE MAKING

Address: next to Pharoplast

45. ICI CASSETTES

Next to Pharoe Plast.

46. IBERNA FOR FREEZING

Address: Industrial Zone (near pharoe plast)  
Office: 20 Gawad Hosni str., Cairo  
P.O. Box 12556/53 El Haram  
tel. 858699 factory 757446 (office)  
Contact: General Manager Mr. Mahfouz Youssef

47. VERA EGYPT

Address: P.O. Box 2878 El Horreya, Heliopolis, Cairo  
Tel. 722790  
Telex: 92564 ATLOZ UN  
Contact: Chem. Samir Khalat

48. MIDDLE EAST PLASTICS

Address: 18 Cizosstriess str., Alex.  
Tel. 25965 - 26434 office  
63336 -, 63299 factory  
Contact: Zaki Farag, Chairman

49. FARMA CO FOR RUBBER AND PLASTIC.

Address: 5 Wafaa El Din str., El Basateen, Cairo

50. PLASTICA CO.

Address: Misr/Ismailia Rd., Industrial zone, Behind Pretty bdar

51. PAN ARAB PLASTICS

Address 122 Mohy El Din Abu El Izz, El Mohandseen, Cairo

52. El Karnak Plastics

Address: Torel str., El Ras El Soda, Alex.  
Contact: Mohamed Tawfik owner

53. MISR FOAM

Address: El Hawamdeyah Factories, Giza 32  
Office 32H Mourad str., Giza  
Tel. 896847

54. NATA PLASTICS FACTORY

Address: Torel str., El Ras El Souda, Alexandria.

55. JITAL FOR PLASTICS

Address: Torel str., El Ras El Souda, Alexandria.

56. RADIO, TRANSISTOR AND ELECTRICAL EQUIPMENT ARAB CO.

Office: 15 El Kadi street, El Ahram Ave., Giza

Factory: Ismailia, 1 Telemasr str. Ismailia.

57. CANALTEX

Address: factories Bahteem, Shoubra El Khema, Ismailia

Office: 7 Abdel Khalek Tharwat str.

Tel. 748120 - 755507 - 944774

58. ABCO EGYPT

Address: El Tabya str., Gheet El Enab.

Contact: Mahmoud Awad (owner)

Safwat Sadek (Plant Manager)

59. SHEMTO

Address: 16B 26 July Str., Second floor, Cairo

P.O. Box 2138 Cairo

Tel. 757044 - 757185

Tlx. 22488 SHTO UN

Alexandria Factory, 24 El Mofatesh str. Hadarra.

60. MODERN INDUSTRIES COMPANY (PRIVATE CO.)

Address: 133 El Zaraf str., El Sahel , Cairo

61. MIDDLE EAST AND ARABIC UNION PLASTICS (PRIVATE CO.)

Address: 115 Kassarat El Haladeiah str., El Zawya El Hamra  
Cairo.

62. SHAR PLASTICS CO. (PRIVATE SECTOR)  
Address: 115 Kassarat El Haladeiah str.  
El Zawyah El Hamra, Cairo
63. EL FARES PLASTICS CO. (PRIVATE SECTOR)  
Address: 65 Abbasia str., Waili, Cairo
64. FERIOS PLASTICS (PRIVAT SECTOR)  
Address: 8 Zakaria Ahmed str., Azbakia,  
Cairo.
65. MODERN TECHNICAL PLASTICS FACTORY (PRIVATE SECTOR)  
Address: 15 Sidi Badawi Khalil str.,  
El Zawya El Hamra, Sharabia, Cairo
66. FAWZI HUSSEIN HASSANIEN PLASTICS (PRIVATE SECTOR)  
Address: 5 Darb Moustaf str., Moski, Cairo
67. EL SAFA FOR PLASTICS PRODUCTS (PRIVATE SECTOR)  
Address: 16 Abdel Khalek El Zoghbi, Shoubra
68. ARABIC PLASTICS CO. (PRIVATE SECTOR)  
Address: 319 Shoubra str., Cairo
69. CAIRO COMPANY FOR SMALL PRODUCTS (PRIVATE CO.)  
Address: 13 El Tarabeshi Factory str.  
Cairo.
70. EL KODS PLASTICS FACTORY (PRIVATE SECTOR)  
Address: 20 El Konayesi str.,  
El Kharanfash, Cairo.
71. CLEOPATRA PLASTICS COMPANY (PRIVATE SECTOR)  
Address: 12 Meadi Hospital, Boulak,  
Cairo.

72. CAIRO PLASTICS FACTORY (PRIVATE SECTOR)

Address: 41 Naguib El Rehany str.  
Cairo.

73. MODERN PLASTICS CO. (PRIVATE SECTOR)

Address: 415 Port Saeid str.,  
Cairo  
Factories: 71 Industrial Zone, Heliopolis

74. ELECTRICAL FABRICATING FACTORY (PRIVATE SECTOR)

Address: Industry Zone

75. MOHAMED ABDEL AZIZ PLASTICS CO. (PRIVATE SECTOR)

Address: 18 El Sheikh El Sayem str.  
Bab El Sharia, Cairo.

76. COLGATE PALMOLIVE EGYPT (PRIVATE SECTOR)

Address: Alexandria Amreya Road, Om Zeghaew  
Alexandria.

79. EL KADDI PLASTICS (PRIVATE SECTOR)

Address: El Bab El Akhdar, El Labban,  
Alexandria.  
Tel. 35482

80. EL MOHANDES PLASTICS CO. (PRIVATE SECTOR)

Address: 41 El Zaher str., Moharem Bey;  
Alexandria.

81. SALUMEL FOR FORMAYKA CO. (PRIVATE SECTOR)

Address: Industrial zone.  
Tel. 803356 - 804208 Amreya.

82. EL HORREYA FOR PLASTICS (PRIVATE SECTOR)

Address: Canal El Mahmoudia Road,  
Moharem Bay. The other side of Mahmoudia branch

83. EL NEGMA FOR RUBBER AND PLASTICS (PRIVATE SECTOR)

Address: Mohamed Ibn Moussa from Moustaf Kamal  
Alexandria.

83. EL SALAM MODERN CO. FOR PLASTICS (PRIVATE SECTOR)  
Address: GAMILA Bohreed, Victoria.  
Tel. 65476
84. NADER PLAST COMPANY( PRIVATE SECTOR)  
Address: 44 Canal El Mahmoudia Road, Nozha.
85. GAD PLAST COMPANY/ (PRIVATE SECTOR)  
Address: 123 Abdel Rahman El Rafei str.  
Alexandria.
86. PLASTICS AND RUBBER PRODUCTS CO. (PRIVATE SECTOR)  
Address; 498 Castania Str., Alexandria
87. HEGAR PLAST COMPANY (PRIVATE SECTOR)  
Address: street No. 593 Sidi Bishr, Montazah  
Alexandria.
88. SAHARMAN FOR MANUFACTURING PLASTICS (PRIVATE SECTOR)  
Address: 8 Zonharolla str.  
Tel.: 20476
89. ALEXANDRIA FOR PLASTICS INDUSTRY (PRIVATE SECTOR)  
Address: 5 Orabi square, Manshia, Alexandria
90. AMREYA COMPANY FOR PLASTICS PACKAGING AND WRAPPING (PRIVATE SECTOR)  
Address: Alexandria- Amreya class 1, Block 30  
Tel.: 864393
91. REHAB PLASTICS CO. (PRIVATE SECTOR)  
Address: Semouha, Alexandria
92. EL AMIEN PLASTICS (PRIVATE SECTOR)  
Address: 61 Mansheiat El Bakry str.  
Sales office: 63 El Makrizi str.  
Tel.: 586779 - 824907

93. EL NASR FOR FABRICATING CARS (PUBLIC SECTOR)

Address: factories Wadi Houf

Office: 1081 Kornish El Nil str.

94. Pharooplast Co. (Private Sector)

Address: Factories: Mohawelat Road (branched from Cairo-Alex.  
highway, 28 km. from giza

Tel.: 739803 - 739843

Contact: Mr. Ali Abdel Rehiem

Mr. Fathy El Kholy

Mr. Hussein El Kashouti

Office: 439 El Ahram Road, Giza

Tel: 853172 - 852350

95. ABU ELHOL FACTORY FOR PLASTICS (PRIVATE SECTOR)

Address: 17 Donshoway str., Shoubra El Sahel, Cairo

96. HELLIOPLAST FOR PRODUCING PLASTICS AND NYLON (PRIVATE SECTOR)

Address: 24 El Seddiek str., El Zaytoun, Cairo.

97. ZAGAZIGIGPLAST CO. (PRIVATE SECTOR)

Address: Raznah Village, Zagazig, Sharkeya

98. NADIA PLASTICS CO. (PRIVATE COMPANY)

Address: 4 Makhzan El Khashab str., Moski,  
Gammaleiah, Cairo

99. AMER PLASTICS COMPANY (PRIVATE SECTOR)

Address: 13 El Gaeme str., Gammalieh

100. ISMAILIA FOR PLASTICS (PRIVATE SECTOR)

Address: 12 El Bustan str. Ismailia

101. DOASH FACTORY FOR PLASTICS (PRIVATE SECTOR)

Address: 9 Istanbul str. Attarien, Alexandria

102. El-Amal Company for Plastics (private Co.)

Address: 19 Ramadan Shokry str. el Zaher, Cairo.

103. EL FOAM INDUSTRIES COMPANY (PRIVATE SECTOR)

Address: 7 Faddl str. (branched from Talaat Harb str.)  
Cairo.

104. EL GAMIEL PLASTICS FACTORY (PRIVATE SECTOR)

Address: El Gamiel Str., Faggalah, El Zaher, Cairo

105. EL NASR FACTORY FOR PLASTICS (PRIVATE SECTOR)

Address: 157 El Moezledinelleh str., Gammalia, Cairo

106. THE TECHNICAL MODERN FACTORY FOR PLASTICS PRODUCTS (PRIVATE SECTOR)

Address: 15B Khaliel El Nayli str. , Cairo

107. SHOUBRA PLASTICS CO (PRIVATE SECTOR)

Address: Kalube.

108. DAMIETTA PLASTICS FACTORY (PRIVATE SECTOR)

Address: El Haras El Watany Division 3 - Damitta.

109. YOUSSEF GHALI PLASTICS FACTORY

Address: 10 GAMEI EL Hawanem str. Bigam Rd. Shoubra El Khema  
Cairo.

110. RONY PLASTICS FACTORY (PRIVATE SECTOR)

Address: 16 Seket Darb El Genena, Moski, Cairo

111. EL SHARK FACTORY FOR PLASTICS

Address: 8 Misr Company str., Mataria, Cairo

112. UNION CARBIDE EGYPT

Address: 6 Ibn Taimeiah str., Zamalek, Cairo

113. PEN PRODUCING AND PLASTICS COMPANY

Address: El Ahram Bldg., El Galaa str. Cairo

114. ESMAPLAST FOR SHOES PRODUCING

Address: Industrial Zone, Ismailia



115. EL NEMR PLASTICS CO.

Address: 20 El Nasieg Factory str., El Zawia El Hamra  
Cairo.

116. EL AMAL FOR PRODUCING CABLES

Address 11 El Ddebita str., Moski

117. EBN EL NEEL FOR PLASTICS

Address: 13 El Moski str., Cairo

118. COSMO PLASTICS FACTORY

Address: 72 El Gomhoria str. Azbakia, Cairo

119. EL ZARKA FOR PLASTICS PRODUCTS

Address: 45 El Azhar str., Moski Cairo

120. HENDAWI PLASTICS FACTORY

Address: 26 Sicili str., Cairo

121. EL AMIER PLASTICS FACTORY

Address: 125 Shoubra str., Cairo

122. PLASTO TRADE

Address: 15 Bassam Sherief str., P.O. Box 1218, Cairo

123. GALLIEN FACTORY FOR DRY BATTERIES AND PLASTICS

Address: 5 Nabolsi str., El Mohandseen, Cairo

124. THE ENGINEERING COMPANY FOR PLASTICS

Address: 30 A El Sheikh Kamar str., El Zaher, Cairo

125. PLASTICS ORIENT

Address: 27 Afifi str., Agouza, Cairo

126. BACALA PLASTICS

Address: Shoubra El Kheima, Kalube, near plastic club.

127. MELCO FOR PLASTICS PRODUCTS

Address: 4 Masged El Salmaneia str., Bolak, Cairo

128. BIGAM PLASTICS FACTORY

Address: 7 Waheed str., Cairo

129. EL WADI PLASTICS AND BACALIET

Address: Ard Ismail Oda, near Plastics Club, Shoubra El Kheima

130. EL SHAMAL FACTORY FOR PLASTICS

Address: 39 Rod El Farag, Shoubra, Cairo

131. THE UNITED COMPANY FOR PLASTICS INDUSTRY

Address: 445 Canal El Mahmoudia str. Nozha, Alexandria

Tel. 79937

132. ALEXANDRIA FACTORY FOR PLASTICS (ALPHA)

Address: 23 El Nakieb Sherief Ramzy str., Alexandria

Tel. 77982

133. NILE FACTORIES FOR RUBBER AND PLASTICS

Address: 454 Canal El Mahmoudia str., Nozha, Alexandria

Tel. 70463

134. MAATALANI FACTORIES FOR PLASTICS

Address: 9 Sanan str., Manshia, Alexandria

Tel.: 803256

135. AZZA FACTORIES FOR PLASTICS (PRIVATE SECTOR)

Address: street No. 287 (branched from Mohamed Ali) Alexandria

Tel.: 21926

Contact: Mr. Abdel Aziz Mohamed Osman

136. LEMA FACTORY FOR PLASTICS

Address: 32 Salah Salem str., Alexandria

Tel.: 807399

137. ABU KIER FOR FERTILIZERS AND CHEMICAL PRODUCTS (PUBLIC SECTOR)

Address: 48 El Horreya Ave., Alexandria

Tel./ 24817 (office)

138. BAKHESBAN FACTORY FOR PLASTICS

Address: 19 Abokrat str., Azarita, Alexandria

139. THE NILE CO FOR PRODUCING MATCHES (PUBLIC SECTOR)

Address: 19 El Sahafa str., Alex.

Tel.: 800588 - 800567

140. THE SALT AND SODA CO.

Address: Canal El Mahmoudia str. Alexandria

Tel.: 25875

141. EAST PLASTICS PRODUCTS FACTORIES

Address: 46 Nemat Mokhtar str. Haddara, Alexandria

Tel. 72518

142. ALEXANDRIA FACTORY FOR BATTERIES AND RUBBER

Address: Tot Ankh Amoun str. Sidi Gaber, Alexandria

Tel.' 76429

143. EL SALAM COMPANY FOR PLASTICS

Address: Gamila Bohread str., Alexandria

P.O. Box 284

Tel.: 65476 - 65976

144. BATA CO.

61 El Ekhshidi str., El Kabbari, Alex,

Tel.: 32790 - 24640

145. SABRINA FACTORY FOR PLASTICS Bolls AND TOYS

Address: 21 Etman Galal str., Moharem Bay, Alexandria

Tel.: 38062

146. THE NEW ARABIAN FACTORY FOR BUTTONS INDUSTRY

Address: 21 Kafr Abdou str. Roushdy, Alexandria

Tel.: 843512

147. SMOUHA FACTORY FOR PLASTICS

Address: 6 Zaki Naguib str., Semouha, Alexandria

148. THE INTERNATIONAL PLASTICS CO.

Address: factories : the Industrial Zone, Moharrem Bay  
Alexandria.

Office: Istanboul str. Alexandria

149. HADY PLAST COMPANY

Address: Castania str., Montazah, Alexandria.

150. THE ARABIAN COMPANY FOR PLASTICS INDUSTRY

Street No. 35, Semouha, Alexandria

Tel.: 76429

151. THE ARABIAN PLASTICS COMPANY

Address: 319 Shoubra str., Cairo

Tel.: 948825 - 946477

152. THE EGYPTIAN PLASTICS COMPANY

Address: 43 El Sabaa Ka'at El Baharia str. El Moski, Cairo

Tel.: 917724

153. DYE STUFFS AND CHEMICALS COM. (ISMADYE) (PUBLIC SECTOR)

Address: 48 El Horreya Ave., Alexandria

Factory: Kafr El Dawar

Tel.: 977060 - 40347

154. ESSO CHEMICALS (PRIVATE SECTOR)

Address: 2 Simon Bolivar sq., Garden City, Cairo

P.O. Box 313

Tel.: 28330 - 25396 - 28188

155. EL NASR CO FOR PRODUCING FERTILIZERS AND CHEMICAL PRODUCTS

Address: Talkha Mansoura

Tel.: 3427

156. CANALTEX COMPANY FOR FLOORING (PUBLIC SECTOR)

Address: 10 Abdel Khalek str., Cairo

157. MISR PETROLEUM COMPANY (PUBLIC COMPANY)

Address: 6 Orabi str., Azbakia, Cairo

158. RACOPLAST

Address: 44 Sherief str., Cairo

159. KAWTHAR FOR PLASTICS AND RUBBER

Address: 5 Abdel Wahab El Shanawi, El Zaher, Cairo

160. GHALI PLASTICS

Address: 104 Shobra str., Cairo

161. SALAH ABDEL HAMID PLASTICS

Address: 6 El Sheikh El Fayomi str. , Hadayek El Kobba, Cairo

162. OTTMAN FOR PLASTICS PRODUCTS

Address: 505 Port Saied str., Cairo

163. ART PLAST.

Address: THE Industrial Zone, Abbasieh, Cairo

164. EL MADINA EL MOUNAWARAH FOR PLASTICS

Address: Dr. Mohamed Abdel Azim, Mansoura

165. ALPHACHIRO FOR PRODUCING POLYACETONE

Address: 3 A Seket El Manakesh str., El Madabegh, Misr El Kadima,  
Cairo

166. PLASTOPRINT

Address: Hoad El Rodda, No. Miet Halfa, Kalubeiah

167. COOPERATIVE SOCIETY FOR PETROLEUM

Address: 94 El Kasr El Ini str., Cairo

168. HAYA FOAM FOR FOAM PLASTICS

Address: 10 El Azhar str., Azhar, Cairo

Factories: Class 11283 Industrial Zone, Cairo

169. MISR FOAM

Address: Amreya, Alexandria

170. NEW ACRYL FACTORY

Address: factory 14 El Mahdi str., from Gomhoria, Cairo

171. ABCO EGYPT (PRIVATE SECTOR)

Address: El Tabiah str. , Kheet El Enab, Alexandria

Contact: Eng. Mahmoud Awad

Eng. Safwat Sadek, Plant Manager

172. THE NEW FACTORY FOR ELECTRIC PIPES

Address: 4 Naguib El Rehani str., Cairo

factory: 8A Elnaam str., Mataria, Cairo

173. MIDDLE EAST COMPANY FOR BATTERIES AND ELECTRIC PARTS

Address: 18 Sisostris str., Alexandria

174. THE ENGINEERING FACTORY FOR ELECTRIC PIPES

Address: 62 Naguib El Rihani str., Azbakia, Cairo

175. NAMATEX FACTORY FOR ELECTRIC PARTS

Address: Miet Nama, Cairo/Alex. Highway

176. ELGOMHORIA COMPANY FOR PLASTICS AND ELECTRIC PARTS

Address: 36 Zki Naguib str., Semouha.Alexandria

Tel.: 73735

177. ELECTRO CABLES EGYPT

Address: 40 Tallat Harb str., Cairo

P.O. Box 208 Cairo

Tel.: 745641

Telex: 92689

178. SUPERPLAST COMPANY FOR PACKAGING

Address: 503 Port Said str., Miet Halfa, Kalube

179. 4M COMPANY FOR MANAGING AND INVESTMENT

Address: 4 Talaat Harb str., Cairo

Factory 6 El sawah str., Amiria, Zaytoon, Cairo

180. BELCO FACTORY FOR PLASTICS

Address: 4 El Samayna str., Boulak, Cairo

181. THE UNION COMPANY FOR COMMERCE AND MANAGEMENT

Address: 5 Kaneeba El Debanna str., Alexandria

182. ISMAILIA FACTORY FOR PLASTICS PRODUCTS

Address: 12 El Emam Ali str. Ismailia

183. DARWISH MOUSTAFA FOR PLASTICS PACKAGING

Address: 1 El Safi str. (from El Gazeer str., Alexandria

184. HAMED MOUSSA COMPANY

Factory: 6 Mogamma El Masane, Amieria, Cairo

172 Mohamed Ali str., Cairo

185. UNIVERSAL COMPANY FOR SELF ADHESIVE MATERIALS

Address: Factories 10th of Ramadan City, B2 Zone

Office: 27 Gezeria str., Zamalek, Cairo

P.O. Box 65

Tel. 803910 - 651493 - 811765

Telex: 93388 IDCO UN

186. BACALA PLASTICS COMPANY

Address: factories Shobra El Khema (near National Plastics)

Tel.: 760243 - 744274

Contact: Mr Hussein Fahmy Assran (Home Tel. 818888

187. ETRA PLASTICS

Contact: Eng. E. Gaafar

- 38- - FABERGLASS AND PLASTICS COMPANY  
319 Shobra Street - Elsahel - Cairo
- 39 - PLASTICA COMPANY  
20 Elmarashii Street - Zamalek - Cairo
- 30 - EL NIEL FACTORY NYLON SACS  
10 ELMEZAYEN STREET - MOSKI CAIRO
- 31 - GAAFAR PLASTICS FACTORY  
2 A Olfat El Shazli - Bab El Shaareia - Cairo
- 32 - EL SAYED FATHI FACTORY FOR CABLES AND PIPES  
El Tabia El Bahareia - Boulak El Dakrour - Giza - Cairo
- 33 - The INTERNATIONAL COMPANY FOR BUTTONS  
35 Elsanadili Street - (from El Malek Fesal Street) -Giza - Cairo
- 34 - El Malek COMPANY FOR PLASTICS  
41 Nagieb El Rihani Street - Azbakeia - Cairo
- 35 - MARIGAC FACTORY FOR PLASTICS  
166 El Hegaz Square - Heliopolis - Cairo
- 36 - UNITED INTERNATIONAL PLASTICS COMPANY  
Menouf - Menofeia
- 37 - HELAL BLASTICS SOCIETY  
222 Hagaz Square - Heliopolis - Cairo  
Tel: 458132 Telex : 21162 UN
- 38 - GITAL PLASTICS  
5 Tawil Street - Ras El Soda - Alexandria  
Tel: 969047



