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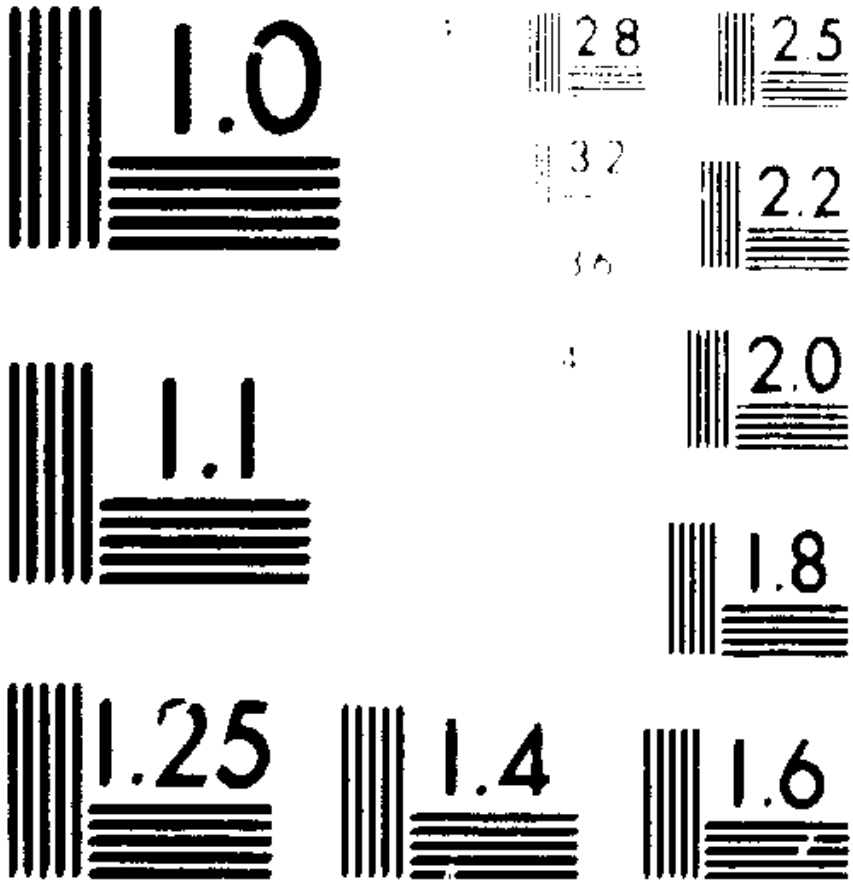

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THE PLASTICS INDUSTRY IN THE ARAB REPUBLIC OF EGYPT

A SURVEY OF ITS POTENTIAL

by

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The writer of this report is solely responsible for the views expressed therein and these do not necessarily reflect the views of the Secretariat of UNIDO.

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SUMMARY

It is apparent that the Egyptian plastics industry has reached the stage where there must be an acceptance of the need for proper technical development in terms of men and equipment if it is to make its proper contribution to the country's economy. The growth has been particularly strong in packaging with high investment in equipment for making bottles and crates. The general approach however is one of production for direct sale to a consumer market where there are no standards and control testing is considered unnecessary.

The survey has shown that there is enormous potential in the housing and construction industry which at present uses very little plastics other than for electric cables. The University of Cairo (Faculty of Mechanical Engineering) has been particularly concerned with the potential for plastics pipes and at meetings with industrialists, it has been agreed that there is an urgent need for improved standards and for an independent testing centre. This role could be undertaken by the PDC but it must take vigorous action to meet the challenge.

The plastics industry is in urgent need of technical staff and this will become a more serious problem if developments in the use of pipe in construction and for irrigation in agriculture are adopted.

There is great interest by certain manufacturers in supplying plastics to agriculture but considerable guidance will be needed from the PDC if the requisite performance requirements are to be met.

The Petrochemical Complex comes on stream in 1984 with the manufacture of pvc followed at a later date by the polyolefins. The complex is looking to the PDC to help manufacturers in the formulation of compounds and a change-over from present suppliers.

Discussions were held in Paris with the Secretary-General of CIPA on the programme for the seminar on 'Plastics in Agriculture' to be held at Alexandria in December 1981.

1. INTRODUCTION

Since the change in Government policy in 1975 the plastics industry has made great strides particularly in the private sector and the per capita consumption has increased from 750 g per person in that year to 2.5 kg in 1979. This growth is expected to continue and the anticipated figure for 1982 is 4 kg.

This stimulus will arise to some extent from the declared policies of the Government. It was reported in Le Progres Egyptien (11.3.81) that 3 m hectares of new land will be cultivated over the next 5 years and Mr Osman Ahmed Oosman, the new Vice-Minister for Development, envisages 1,500,000 housing units over the next ten years. He added "qu'il etait en faveur d'initiative privee et qu'il reprochait au secteur publique sa mauvaise administration".

The present level of oil production is 700,000 barrels per day and it is planned to increase this by 50%. During the next three years natural gas will be piped to 50,000 houses in Cairo.

It was against this background that the present survey has been carried out, its aim to extend that carried out in 1980 by Mr J.E.S. Whitney (1) and to examine those areas of activity which should be of interest to the Plastics Development Centre at Alexandria

The proposal to construct a Petrochemicals complex with the manufacture of polymers will obviously have a considerable effect on the pattern of growth of the plastics industry, even if only by lowering prices because of elimination of import duties which are levied on all of the raw materials used at present.

Unfortunately the 1979 edition of the Egyptian Industries Yearbook has not yet been published so it is not possible to up date the figure given previously (1).

2. ITINERARY

After arrival in Cairo on Sunday, 1st March, the following day was occupied in the briefing at UNDP, after which the journey to Alexandria was made by train. The period 2nd to 17th March was spent in visits to local industry and then the return journey to Cairo was undertaken by car. The time in Cairo was spent in visiting local industry, various official organisations, the International Fair and the University of Cairo. After a discussion at the UNDP office on the impressions gained, the return journey to Vienna was made on Sunday, 29th March.

After this, two days were spent in the offices of the Comite International des Plastiques en Agriculture at Paris to formulate a programme for the proposed seminar to be held in Alexandria in December and to retrieve certain information on the use of plastics in agriculture.

3. GENERAL STATE OF THE EGYPTIAN PLASTICS INDUSTRY

The rapid expansion over recent years has been mainly in those sectorswhere the products manufactured are for direct consumer use and there is no criteria on quality, just that of price. This covers articles such as moulded pvc shoes, household articles, shopping bags and especially packaging in the form both of flexible film and blow-moulded containers. These are essentially short term applications where the life of the product is limited and does not have to conform to a performance standard.

There are other areas such as electric cables where a technical specification is called for, but in general the industry is run on an entrepreneurial basis with no attempt to control the quality of production or establish standards.

Where such standards and performance specifications are essential to the use of plastics, and this applies particularly to the building industry very little progress has been made. It is unlikely that this situation will change until a very positive force undertakes to guide the plastics manufacturers and at the same time shows the potential users in the building industry what can be achieved.

The present growth has encouraged investment particularly in the private sector and it is evident that the management are buying the most up to date equipment from Europe and the States. Opportunity is taken to send the senior operating staff for training and by purchase of polymers from reputable suppliers it is possible to manufacture to an acceptable standard for most of the time. Quality control testing is considered unnecessary on the basis that by using good material with the right equipment and with the experience of the personnel a satisfactory product will be obtained. Old out-dated equipment, much of it purchased 20 years ago, continues to be used for the manufacture of less critical articles while the demand continues. Factory lay out (or lack of it) reflects the rapid increase in manufacturing capacity and much equipment is oprated under conditions where maintenance cannot be satisfactory and the handling and storage of raw materials makes mistakes very likely.

It is essential to have an engineering industry which is capable of making moulds and dies for plastics fabrication. This does not exist and some companies have their own facilities for making the simpler types of moulds, e.g. for blow-moulding. For high quality moulds with the proper finish it is still necessary to go to

manufacturers in Europe, The Engineering and Design Centre has the facilities but is lacking in the expertise; little progress appears to have been made since the visit of Mr J. E. Nightingale (2) just over a year ago.

There is a universal complaint about the shortage of technical personnel with a knowledge of plastics; some companies particularly National Plastics and Medical Packaging in the public sector run their own training programmes but there is the feeling that the Universities should be doing much more; at present the subject of plastics is almost completely ignored.

Technical staff with some experience tend to move into the private sector where remuneration is more generous, but the real attraction is to take up a post in one of the Gulf States where the rate of pay is much higher.

Although many companies suggested that the PDC should provide training courses, it is unlikely that the industry will make effective use of properly trained personnel while it continues to operate according to its present attitudes. If however there is a recognition of the potential for growth in certain sectors (agriculture and building) and of the acceptance for the manufacture of particular products with a design performance established by specifications, then the need and prospects for technical staff will improve considerably. But unless they are adequately well paid, the more competent are bound to migrate.

4. BASIC PLASTICS RAW MATERIALS

The position on the basic plastics used by the industry remains much the same as that outlined in his report by J. E. S. Whitney (1).

1. L.D. Polyethylene

The usage of LD polyethylene is still concentrated in the packaging sector with a growth rate of 10% as forecast. The extension of the usage for agriculture is likely to be slow during the next year or two while trials are being carried out. If the film on protective structures is used just for one year, then the amount of polyethylene required will be of the order of 1.5 tons per hectare covered (this is much the same for both low and high tunnels). But even with the other uses in this sector such as mulching, canal lining and drip irrigation it is unlikely to reach the amount of 25,000 tons by 1985 (1) a figure of 5,000 tons would be much more realistic.

2. H.D. Polyethylene

The growth rate is running rather higher than as was forecast last year. With the increasing demand for blown containers and the manufacture of crates for handling various types of produce, the amount used is approaching that of LD polyethylene.

It was noticed that polymer from many manufacturers is used by most companies, the decision to purchase being determined by the price on offer at the time. The change from one material to another seems to present no problems in blow moulding but in the absence of control testing it is not possible to establish if the containers are always acceptable; it has been reported that the packaging industry is suffering from poor and variable quality containers produced by the industry.

3. Polypropylene

This is showing signs of a rather higher rate of increase than predicted with the use of moulded PP battery boxes and Egyptian Plastics are soon to start manufacture. The moulding of chairs accounts for about 300 - 400 tons of PP and with about 2,500 tons for woven sacks, and the other applications as previously reported (1), the overall total is probably 7 to 8 thousand tons. The whole structure could change with the price relationship with HD polyethylene, firstly it is expected with a future shortage of propylene, the price of PP and its co-polymers could increase much more than the other polyolefins and also if HD polyethylene is manufactured at an earlier stage by the Petrochemical Complex.

4. Polystyrene

There is very little growth in the use of polystyrene but with the planned increase in the production of refrigerators the amount of high impact material could increase by about 5,000 tons in two years time bringing the overall total to about 10,000 tons. The growth in the use of expanded polystyrene will be off-set by a changeover to rigid polyurethane for refrigerator insulation.

5. Polyvinyl Chloride

The total overall usage for 1980 is reported at 35,000 tons, of which about 6,500 tons is emulsion resin used for the paste coating of fabrics. The bulk of the polymer is the suspension type which it is proposed to manufacture in the Petrochemical Complex. At present some of the PVC is imported as resin, some as powder compounds and some as granules. The resin is used mainly by two companies which produce a whole range of compounds for the smaller

operators. The quality varies enormously, El Shariff which uses about 15,000 tons/annum has a poor reputation but the other company Al Shante produces a range of good quality materials in accordance with a number of BS specifications. The powder compound (9,000 tons) is imported from Diamond (US) and Kuhn (W. Germany) and is used for the extrusion of corregated pipes for land drainage.

Only a relatively small amount of PVC is used for blow moulding bottles and this is almost completely imported as a specially formulated compound in granular form for each application.

There is quite a gap between the present usage and the proposed output of the new plant which will come into operation in 1985 and this is discussed below.

6. Thermoset Resins

The pattern of consumption of these resins remains much the same as reported previously with increases in production of decorative laminates.

The real area of potential growth lies with glass reinforced polyesters with the acceptance of large diameter spun pipes for sewerage, the present usage is of the order of 1,000 tons/year for this application, but with the development of chutes and tanks based on the same technology this company is likely to expand output rapidly (~ 50% for the next 3 to 5 years).

5. REVIEW OF AREAS OF APPLICATION

1. PACKAGING

The growth pattern for this area of application seems to be about 25% per annum with the main emphasis on the polyolefins. The market has been very receptive t, plastics and manufacturers have managed to meet the needs by installing high productivity equipment and fulfilling the short term requirements by the consumer.

a. Blown Bottles

The demand for blown bottles is stimulated by a shortage of glass bottles and most producers do not need to employ a sales force - the customer makes the initial approach. High density polyethylene or in a blend with low density is most widely used, and although it is not ideally suited for the application, vegetable oil is packed in it on the basis that consumption is high and a shelf-life of two to three months is adequate. The full potential for this product is a long way from being satisfied and the use of HDPE bottles will continue to increase. There is now a change-over taking place and car engine oil will in future be packed in HDPE. Jerry-cans of up to 5 litres are widely used for conveyance and storage of a whole range of products.

Most manufacturers have good modern equipment and this is being supplemented every year to cope with the increasing demand. Fischer blow moulding machines are preferred because this company has a sales service depot in Egypt. It is expected that the two other major machine suppliers Bekum and Kuntex will shortly follow suit.

HD polyethylene is purchased from any reputable supplier, usually on the basis of the best price, but Hoechst GF 4760 is widely used.

The manufacturers make practically no attempt to control the quality of the bottles they make but in the main they meet the requirements of an undiscriminating market. This application will expand solely as a result of the producers activity, particularly in the private sector - it offers a reasonable return on the capital invested and there is sufficient stimulus from market forces.

Rigid PVC bottles are regarded as a speciality and are used only for cosmetics and toiletries particularly where the product is made under licence and the type of packaging is specified. The advantages of PVC are recognised by many moulders but the higher cost deters users. One manufacturer had ceased to use PVC for blow-moulding because of the frequency of power cuts during the winter and damage to his equipment by decomposition. One possible use is for the bottling of orange squash which would require 3 m bottles per year.

b. Crates

These have already completely replaced the metal crates for soft drinks such as Coca-Cola and Seven-Up - it is reckoned that there are about 2 m in use, and 25% need to be replaced every year (use of about 600 tons/year of HD polyethylene). The high cost of wood is now encouraging moulders to turn to other possible uses and already it is apparent that the potential is considerable. One tomato grower who exports, intends to replace his wooden crates (costing E£1.10) by a HD PE crate (costing E£2) because the contents (15 kg) will be better protected in transit and damage to the

fruit will be less. The requirement is for 2m in the first year (this would use 2,700 tons of HD polyethylene). Other possibilities are for bread and chicken crates.

One manufacturer who moulds many small items of household-ware is designing a box just for handling his production in the factory because of the high cost of cardboard boxes.

The bottle crates moulded according to European or US design appeared to be well made using materials (mainly HDPE) which are UV stabilised for outdoor application. Some crates for more general use however were of low quality control of the injection process had obviously been inadequate resulting in warping and deformation and frequent damage seemed to suggest that proper regard had not been paid to UV stabilisation.

c. Sacks

Heavy duty PE sacks are widely used for a range of products but it is unlikely that this will increase to any extent; the present manufacturing capacity is for 80 m bags per year but this is not fully utilised. The growth potential lies in woven-polypropylene bags; at present the production capacity is 20 m (each weighing 125 g) split among several manufacturers but it is estimated that they could completely replace jute sacks with an overall demand for 100 m per year.

d. Film Bags and Sachets

There are many producers of lay-flat polyethylene film which is converted into bags for packaging mainly food products; this is growing though rather more slowly than the other applications in

this sector. One of the main producers is Verta in the public sector who blow film up to 0.95 m flat width and of thicknesses varying from 40 to 300 microns (about 1,000 tons/year). No attempt is made to control quality because it is felt that by use of standard blow film equipment with the purchase of high grade PE (From Dow or Ato-chimie), a satisfactory product will always be made, in fact no film testing equipment is available even if problems are encountered. One such problem was found at the Seklam Milk Company which packs milk in welded PE bags; all the film made in Egypt is unsuitable because of weld failures and it is essential to import the film from Spain (a total of about 1,000 tons at the ten milk packing plants).

e. Vacuum-formed packs

These are produced exclusively from high impact polystyrene sheet for packing jam in both individual and bulk packs and dairy produce such as yoghourt. Some manufacturers extrude sheet directly from HE polystyrene granules and utilise their own scrap (14%) by regrinding and blending back with virgin material, while others import extruded sheet and sell their scrap to moulders of low quality injection moulded items. This part cular use is likely to grow at the same rate as the G.N.P. At present there is no move to go over to rigid PVC or ABS because of the higher price, although an improved pack would be obtained for some produce. The packs are regarded as short term.

2. AGRICULTURE

This aspect is receiving special attention and in his report (3) Mr H. R. Spice has highlighted the potential uses of film for protected cultivation.

a. Films

The forced trials now being carried out using imported UV stabilised heavy gauge PE transparent film but it is proposed that an equivalent material will shortly be produced locally. It will be essential to establish the life of such films under Egyptian climatic conditions and determine if economically it is better to use film just for one season and then discard it or develop the stabiliser system which will enable it to be used for a much longer period. If forced cultivation in large structures is to prove successful these aspects of the problem need immediate study.

Black mulch film is already available but the quality is very poor and there seems to be no appreciation to use the proper grade of carbon black at sufficient concentration and with proper dispersion.

Medical Packaging which has committed itself to produce these types of polyethylene films and also a heavy duty black film for lining canals have already carried out some trials but the quality was such that the films were not good enough to last evey one season; this applies to transparent, mulch and canal lining films. Guidance is being given by the supplier of UV stabilisers (Ciba Geigy) but the manufacturer is looking for outside help in assessing performance in the field.

It was learned at the Cairo International Exhibition that calendered black PVC film is now being calendered by a company in Southern Egypt and being used for lining canals according to a technique

developed in the US. For wide canals two thicknesses (0.7 mm) of film are used with an intervening layer of cement but for the narrow feeder canals, only one film is used. About 1,500 tons of pvc are reported to have been used last year, but no other details have yet come to hand.

b. Irrigation Pipes

There is considerable potential for pipes in this irrigation, for drip systems, for feeder tubes for spray systems and also for main supply tubes for conveying water for the traditional flood irrigation technique.

Drip irrigation is unlikely to be used extensively but for the other types of irrigation, with the land reclamation programme, the quantities of pvc and polyethylene could be substantial if the correct development effort is made and pipes of the correct performance were available.

The American Agency for Industrial Development is working with the Egyptian authorities on a pilot scheme (600 Feddans) in the Delta on the replacement of feeder canals for flood irrigation by 10" underground mains. The contract was given to Petro-Jet to supply the system using 10" asbestos-cement pipes with risers at intervals to feed the water to the cultivated areas. Petro-Jet have had difficulty in getting asbestos-cement pipes and also because of higher prices, it was proposed by the company to use plastics pipes imported from Italy. This was not acceptable to AID because of their wish to use materials produced in Egypt.

The main purpose of this scheme is to eliminate feeder canals which are often damaged by cattle and to reduce the risk of infection of the water by molluscs.

c. Drainage pipes

These are already being used (9,000 tons of PVC was consumed last year) but the amount could be much greater. The land drainage schemes in the Delta being financed by the World Bank are still mainly using clay tiles.

The present production of corrugated PVC pipe is carried out at 3 plants with three mobile units mounted on lorries. The quality of the pipe was assessed during the early stages of production by the Faculty of Engineering at Cairo University (3) but the contract was only for a year. The pipe was tested according to BS and DIN standards. It was impossible to discuss this in detail at the Ministry for Underground Drainage; this might have been deliberate because of a chance remark which indicated that a quantity of pipe had become embrittled because of being left stacked outside in the sun, the extent of the problem could not be established but the Assistant Minister seemed to be sceptical of the efficacy of corrugated drainage pipe. It is probable that no systematic control testing is being carried out and some participation by an independent organisation might be necessary to ensure that this application develops successfully.

According to an agricultural consultant it is likely that all the reclaimed land will need to be drained in spite of the sandy soil and if 100 m of pipe is used for every feddan (approximately 30 kgs of PVC), then the projected area of 3 m ha could utilise 220,000 tons over the next 5 years of PVC.

3. BUILDING AND CONSTRUCTION

There is considerable activity in building in the major towns (150,000 housing units are planned over the next 10 years) and large blocks are springing up everywhere; at present the use of plastics (except for the electrical wiring and conduits) is practically nil but the potential particularly for all types of pipes is enormous.

a. Pipes

The main stumbling block to their acceptance is the lack of adequate manufacturing facilities for pipes and fittings, i.e. a complete system and proper specifications and codes of practice for installation. This is the case for pipes for potable water, gas, internal drainage and sewerage.

PVC Pipes (usage of PVC about 11,000,000 tons) are produced up to 8" diameter but fittings are only available for the smaller sizes so that either imported or metal fittings have to be used. The standard of pipe extrusion seems to be variable so that there is often difficulty with fittings in obtaining a tight system.

There have been some installations of internal drainage systems, using imported components, in some prestige buildings (eg Rameses Hotel) when there was difficulty in obtaining the cast iron pipes which had been specified and it was established that there was a 30% savings on the total cost of the job.

There has been some attempt at seminars organised by Cairo University/M.I.T. to stimulate manufacturers and other bodies such as the Standards Organisation to co-operate in drawing up complete specifications so that industry will have proper guidance on the

standards to be adopted and thereby encourage the investment for a complete pipe plant with a full range of fittings. The University feel that it is not their role to be active in getting all the interested parties together and carrying out all the essential technical work for producing the required standards, and in fact industry would not accept the University which is considered as 'not in touch'.

There appears to be sufficient money available for investment in plants for pipe systems; a new extrusion unit in the area of Ismailia will shortly be on stream but it was not possible to find out exactly what it is intended to manufacture. There is also rumour of a large investment by Kuwaiti investors but no details were obtainable.

The present position on the manufacture of pipe systems is completely chaotic and the situation will only deteriorate unless some organisation provides the driving force to bring all interested parties together and direct their efforts to formulating the essential standards. The PDC will be well suited to do this, it will have the necessary testing facilities but it depends how quickly it can get into its stride; the role will become more difficult as time goes on. It is essential however if the plastics industry is going to reach its full potential and take advantage of the manufacture of polymers in a few years time.

There is one area in which progress is being made and that is in the use of large GRP pipes for sewerage mains. The company manufacturing them (60 cms to 1.8m diameter) according to Norwegian technology has seen its turnover increase by 50% over the last

year. The technology is backed up by complete testing to A.S.T.M. standards. The pipe has been accepted by local authorities and is now being used for new sewerage installations in both Alexandria and Cairo, it just shows how a factory dedicated to a complete pipe system can be successful.

b. Windows

There are some moves to introduce PVC windows into the market, one company is importing extrusions for assembly of the 'Trocal' window which is double-glazed. This is not really required in Egypt and another manufacturer (Plastica) proposes to extrude the profiles required for a single glazed window based on an Italian design. This same company is now extruding PVC profiles for skirting window blinds and cladding, both internal and external. In only two years, production has reached 250 tons per annum and the high price of wood, should enable a high growth rate to be maintained.

c. Flooring

There is just one company producing PVC floor tiles under licence from Dunlop and the quantity (80,000 sq metres/year) has remained static for several years; continuous flooring is also available but sales are low and it is unlikely that vinyl flooring will make great strides; in a warm climate such as Egypt ceramic tiles are well suited.

d. Other possible applications

The use of expanded polystyrene for low weight concrete blocks is being investigated, it is difficult however to assess the potential.

It would appear that there could be wide use of E.P.S. blocks for flat roof construction to provide insulation against the high summer temperatures. Such a development requires a sustained effort and expense which is foreign to the present attitude of the local plastics industry. It should however be considered as a long term possibility.

Overall the building industry presents enormous potential to the plastics industry, but at present there seems little chance of this being developed unless some organisation such as the PDC takes a very strong lead.

4. FURNITURE

The general improvement in living standards is reflected in increasing sales of furniture and consequently of PVC coated fabrics. Two of the main suppliers are planning to increase their output by stepping up the production speed of their equipment. The quality of the product varies considerably, and in most cases no control testing is carried out - as one supplier remarked, "if the customer accepts the material the quality must be satisfactory". While sales depend on price, this situation will continue unchanged.

Metal furniture, both for offices and the home has wide acceptance and this is now undergoing change by replacement of some of the aluminium trim by ABS and PVC extruded profiles. Metal handles are also being replaced by plated ABS moulded items.

At the International Fair one company was exhibiting moulded polyurethane furniture using recently commissioned equipment; the price was high but it does reflect the market demand for a quality

which is often not obtained with the poor quality of the wood available. Because of this last point, the manufacture of 'Formica' type laminates is on the increase.

5. ELECTRICAL

This application is well established and the demand for cables will reflect the extensive building programme in hand. In addition it is proposed to completely replace the present telephone system within ten years with the co-operation of Ericsons of Sweden and this will help to maintain the growth. This will present the opportunity to satisfy the great demand for telephones which are practically unobtainable at present.

The moulding of polypropylene battery boxes has now got under way as previously reported (;) but it will be awhile before it reaches its full potential.

6. HOUSEHOLD APPLIANCES

The production has fallen far short of the demand, and Delta Industrial have plans for trebling their production of refrigerators over the next two years. At present, there is a back-log of 300,000 and the new production will use improved technology with faster outputs. The amount of polystyrene used for sheet extrusion and moulded fittings is about 2,000 tons/year. EPS is used for the insulation but it is intended to replace this by rigid polyurethane foam formed in situ, because of its improved thermal insulation characteristics which allow a thinner layer (4 mms instead of 6) to be used.

6. UNIVERSITY OF CAIRO SYMPOSIUM

This symposium was arranged by the Department of Mechanical Engineering in conjunction with the M.I.T. to discuss the present position and the potential for plastics pipes in Egypt; all leading industrialists together with a number of Government officials were present. A similar meeting had been held in February 1980 (4) when it was agreed that the University would make a survey of the potential for plastics pipes for the housing sector with a recommended specification for the types and sizes. It was also recommended that a well equipped testing centre for quality control of locally produced pipe components and also of imported units should be set up. It was clear that very little had been achieved during the last year except for the University which had put in a significant effort as shown in the reports (5 and 6). Information is given on the relative costs of PVC and steel pipes and fittings. It reckons that 15 - 18% of the total cost of a housing unit goes on the sanitary works using conventional materials and techniques and that appreciable savings could be made by use of plastics piping systems. The importance of having Egyptian standards and specifications for both the pipes and fittings is stressed. So far the Egyptian organisation for standardisation has issued few standards and these seem to have set the pattern for the development for a pipe of a specific polymer and for a specific end use (7).

The most interesting paper presented was that relating to the installation of plastics sanitary systems in various prestige buildings (section 5.3.a). It is proposed to use PVC pressure pipe in the Sadat City project. A technical representative from

Wavin gave a full description of the various pipe systems and jointing methods available. It was clear from the discussion period that the potential for pipes was not fully realised and that many delegates did not fully understand the technical aspects involved. A very positive organising body is needed and with the facilities at its disposal, the PDC could fulfill this role.

The meeting confirmed the recommendations which had been drawn up a year previously but no attempt was made to set up an organising group. At the moment there is no great movement to involve the PDC and it will be essential that the centre becomes fully competent in pipe testing and pipe extrusion if it is to be accepted as an authority.

A tour of the CU laboratories showed the extent of the research work carried cut on pressure and drainage pipes; a shortage of funds had required that the test equipment was made in the University workshops, but it had proved to be reliable and the PDC could benefit by a close liaison with the Faculty of Mechanical Engineering. There are a number of students which have carried out research projects on pipes and these could be very effective in the staffing of the PDC.

7. PETROCHEMICAL COMPLEX

It is planned to start with the manufacture of suspension PVC in 1984 at the rate of 80,000 tons/year. A short list of the companies from which the know-how would be licenced have been drawn up and a final decision would be made in April. A survey has suggested that the production capacity would be in excess of demand initially

and about 30% (25,000 tons) would have to be exported. It is believed that if the full potential for PVC is developed, the capacity can be absorbed in the domestic market. The new plant is not intending to have any technical service facilities so that there will be no guidance forthcoming to those fabricators which at present use resins from other suppliers or purchase powder and granular compounds. A changeover of this nature may take up to a year, this would certainly be the case in the formulation and evaluation of powder compounds for the extrusion of corrugated drainage pipe.

The PDC appears to be the only organisation which will have the right facilities and the capability of doing this, but work will have to start at least two years before start-up with resin imported from the licenser.

The manufacture of HD and LD polyethylenes will come at a later date.

It is proposed also to manufacture 40,000 tons of detergent at an early stage and this will give an added boost to the manufacture of blown bottles.

8. TECHNICAL TRAINING

The lack of a knowledge of plastics by graduates and those trained in colleges of higher education was mentioned at several companies but it is unlikely that it is having any serious effect on those which are manufacturing products for the direct consumer market. The public companies carry out training programmes and very often

production personnel are sent on an extended course to the equipment suppliers in Europe. This is done as a regular routine and generally meets the training requirements of most companies. The most serious need is for technicians and this will be a considerable handicap if the industry is going to develop the full potentiality of those applications which depend on precise performance charecteristics and operating specifications. The PDC will have to recognise this need in the organisation of its training programmes but it will also have to educate potential users where correct installation of a system, e.g. the fitting of pipework, forms an essential feature of the ultimate performance.

9. GENERAL ORGANISATION FOR HOUSING, BUILDING AND PLANNING RESEARCH

This organisation has the responsibility as part of its function to give approval for building products. Dr Ramex, the Director, explained that it has experts in the various traditional materials for the evaluation of building products but this does not apply to plastics. He agreed that the PDC could help to fill this need but that firstly it was essential to develop a knowledge and understanding of the part that plastics could play. Pipes were very important but other products such as wall and floor coverings, extruded profiles, and expanded plastics must be included. A joint seminar was suggested and this could take place towards the end of 1982.

10. PROPOSED SEMINAR ON PLASTICS IN AGRICULTURE

Discussions were held with Mr J.-C. Garnaud of the Comite des Plastiques en Agriculture on a suggested programme for the seminar at Alexandria in December. It was agreed that not more than ten papers should be presented with ample time for the lecturer to develop his theme and for discussion.

Two papers on the current situation in Egypt

i Crop protection and mulch

ii Irrigation and Drainage

	Speakers
Films for Crop Protection PE and PVC	
Canal Linings and Reservoirs	H. R. Spice
Methods of Test for Films	
Ageing of Plastics	M. Verdu - Ecole Superieur des Arts & Metiers
Drainage Piping	Drossvach or Wavin
Adduction Piping - irrigation	Inst Italiano Plastice
Micro-irrigation	Israel

There was need to stress the specific needs for agriculture and the performance characteristics of the plastics in use. The seminar needs to be aimed at the manufacturers of plastics products and guide them on the qualities required.

11. DOCUMENTATION PROVIDED

A copy of 'PLASTICS IN AGRICULTURE' by P. Dubois.

Copy of brochure published by the RSS, Jordan.

Various brochures from major manufacturers of PE and PVC pipe systems.

List of Publications of the Plastics and Rubber Institute.

CEMP 02/_ mai 1971

Reglement pour l'attribution et le Fontionnement de la Marque de Qualite des Tuyaux en Polyéthylene BD.

CEMP 17525/1 juillet 1979

Determination du Jaex de Transmission Lumineuse Relative des Films Noirs.

Technical Leaflet - Thermal Screen for Single Span Tunnels (Lee Valley E.H.S.).

A copy of 'STYRENE POLYMERS AND THE ENVIRONMENT', by C. A. Brighton et al.

Proceedings of PRI Symposium on the Weathering and Ageing of Plastics 1976.

The Mechanical Properties of Polymers (from the Encyclopaedia of Polymer Science and Technology).

P.R.I. monograph on LAMINATES.

12. BIBLIOGRAPHY

1. A Survey of the Plastics Processing Industry in the Arab Republic of Egypt - J. E. S. Whitney.

2. UNIDO Mission to EIDDC Cairo on Mould Design & Manufacture - J. E. Nightingale.

3. Plastics in Agriculture in Egypt - H. R. Spice

4. Report No. 46. Promotion of Engineering Plastics in the Egyptian Housing and Construction Industry (Univ. of Cairo).

5. Towards the Standardisation of Plastics Piping Systems in the Egyptian Housing Industry (Univ of Cairo).

6. Promotion of the Use of Plastics Pipes and Fittings in the Egyptian Housing and Construction Industries. Status Report (Univ. of Cairo).

7. EOS No 847 (1966) PVC Pipes for Industrial Uses.
EOS No 848 (1966) PVC Pipes for Cold Water.

13. ACKNOWLEDGEMENTS

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14. RECOMMENDATIONS

i. Produce a high quality brochure with photographs (of personnel and test equipment) for circulation to plastics manufacturers, governmental organisations and major consumers of plastics products.

ii. Give priority to extending the test equipment in the laboratory.
Drop weight impact test equipment for pipe
Dart Impact Tester (for film)
Hydraulic test equipment for pipes

Environmental stress cracking test equipment

Elmendorf Tear Test (D 1004.66)

and installation of

Twin Screw Extruder with all accessories for pipe manufacture from PVC.

iii. Initiate test programme on the ageing of agricultural films available from various suppliers.

iv. The visit of an expert on physical testing should be given priority and this should be for a period of at least six weeks in the first phase.

v. Collect samples of pipe from all Egyptian manufacturers and test according to standard procedures. Circulate results without identifying the origin of the pipe. Use this document as a means of stimulating interest to form a working group on standards.

vi. Establish close contact and pursue an active role in the promotion of pipes for irrigation with the Egypt Water Use & Management Project.

vii. Establish a close working relation with the Ministry of Underground Drainage to promote the change-over eventually to home-based PVC compounds.

viii. Arrange to have a stock of PVC resin from the licenser when a final decision has been made by Petrochemicals Project and acquire experience with the resins ultimately to be manufactured.

ix. The PDC should become a member of the Rubber and Plastics Research Association to have guidance on technological developments in the industry.

x. Senior staff should become members of the Society of Plastics Engineers (SPE).

xi. In 1982 organise a seminar on Plastics in Building in conjunction with the General Organisation for Building Research.

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