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PLASTIC GOODS MANUFACTURE IN THE EAST AFRICAN SUB-REGION

M65-39

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CHAPTER I

INTRODUCTION

1. Plastics are man-made. They are amorphous, high molecular substances, which can be deformed under mechanical stress without losing their cohesion and are able to keep the new forms given them. They can be shaped and formed when heated and/or put under pressure.

2. The oldest man-made plastic, bakelite, was discovered in 1916. Afterwards, many plastic materials were discovered during the inter-war period, but it was the special requirements of the 1939-45 war which gave the impetus to this industry. What, therefore, before the war was a rather tentative industry became established on a vast scale in Britain, America and Germany.

3. The shortage of rubber led to a great demand for rubber-like plastics for such special uses as waterproof clothing and bags, electric insultation and sponge and foam. These were then found to have superior properties so far as many wartime uses were concerned, and even when the synthetic rubber industry developed, these materials continued to hold their own. The development of organic glasses, such as "Perspex", and polystyrene, needed in large quantities for aircraft and high frequency developments, the invention of polyethylene with its outstanding electrical properties, the application of plastic cements for bonding, and the shell production with phenolic resins led to the establishment of large plants.

4. With the cessation of hostilities, the products of these large plants became available for peacetime uses. Research and development, intensified since 1945, have now resulted in better products, a wider range of new materials for uses such as fibres, high temperature resistance and mechanical parts. The intrinsic merits of plastics are genuinely recognized and some of the deficiencies observed soon after the war have been largely overcome. The modern raincoats and curtains made of PVC are far superior to and more durable than those produced in the late 'forties, and PVC is being increasingly used for raincoats, handbags, shoes and as an

insulator and sheathing material for electric wire. Polystyrene has largely replaced cork and other heat insulation materials. Polyurethanes are now preferred to rubber in the manufacture of sponge and foam products. Nylon and Terylene are entries into the fibre field. Synthetic glues have largely replaced the older vegetable glues for wood jointing and new glues have been developed for jointing metals which have bond strengths greater than metal welds.

5. Plastics not only supplement the conventional materials such as wood, ceramics and metal in many applications, but also function on their own account because of some special property inherent in them. Plastics offer many advantages. They have outstanding mechanical properties, low product weight and cheapness. Plastics permit the manufacture of complicated products in one working operation which were formerly assembled out of many separate parts. The use of plastics has, consequently, become a decisive advantage in the economy of most countries.

6. This paper deals with the processing of plastics into manufactured goods in the countries of the East African sub-region consisting of Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Rhodesia, Rwanda, Somalia, Tanzania, Uganda and Zambia. The 1963 consumption of plastics in the sub-region was around 10,000 tons and almost half of this consumption was in Rhodesia. The main plastic materials used are high pressure polyethylene for films, tubing and pipe; polyvinyl chloride for shoes, tubing and pipes; polystyrene for insulation boards and moulded goods; and polyurethane for sponge and foam. The consumption of plastics is expected to rise to 20,000 tons by 1970, principally through large increases in the use of polyethylene and polyvinyl chloride.

CHAPTER II
CLASSIFICATION OF PLASTICS

7. Although the number of individual plastic materials produced commercially throughout the world runs into several dozens, they can be broadly classified under two groups, namely, the thermo-softening and the thermo-hardening plastics.

Thermo-softening Plastics

8. These soften when heated and harden again when cooled. They can be softened and re-softened indefinitely by the application of heat and pressure, provided that the heat applied is insufficient to cause decomposition. The cooled and formed material becomes hard and retains the form given to it. Both simple and complicated articles can be made in this way in a single manufacturing operation. Scrap and rejects can be used again and again, and the number of times of reuse is limited only by the increasing fatigue and consequent weakening of the material.

9. The most important members of this group are celluloid (nitro-cellulose), Cellulose Acetate, Cellulose Acetate Butyrate, PVC, Polyethylene, Polypropylene, Polytetrafluoroethylene, Polystyrene, Polyacrylate, Polycarbonate, Polyamide, Polyurethane and Polyacetals.

Celluloid, Cellulose Acetate and Cellulose Acetate Butyrate

10. These were the first thermoplastics known and were made by chemical treatment of cellulose, a natural polymer found in great quantities in plants. Consequently, these polymers cannot be called man-made, but only man-modified.

11. Celluloid is nitrocellulose mixed with camphor. The first plastic toys were made of celluloid, but its main use is as a film emulsion support and this use survives in spite of its high inflammability. The search for a non-inflammable material for use in films led to the discovery of cellulose acetate. However, it had some short-comings in that it absorbed water from damp surroundings. Cellulose acetate is the basis of the photographic film industry. It is also used for the manufacture of combs, buttons, trinkets, costume jewellery, handles, etc.

12. Cellulose acetate butyrate has properties similar to cellulose acetate, but surpasses it in regard to higher mechanical stability and lower water absorption. Articles made from acetate butyrate have high tropical and weather resistance qualities. It is used for the manufacture of switchboards, steering wheels and door fittings.

Polyvinyl chloride (PVC)

13. PVC is today the most widely used plastic. When pure PVC is processed, a hard, brittle product called hard PVC is obtained. It is impervious to most diluted or concentrated acids and alkalis, and to oils and alcohols. Hard PVC is used for extrusion of pipes and injection and compression moulding of parts required to withstand acids and alkalis.

14. Soft PVC is obtained by adding softeners to hard PVC. It is non-inflammable and a poor conductor of heat and electricity. It is therefore a good insulating material for electric wire and cable and is being increasingly used for this purpose. Soft PVC finds use also in the manufacture of artificial leather, acid proof clothing, waterproofs, table cloths, floor tiling, curtains, flexible hose and pipe, wire sheathing, shoes, handle grips, bottle stoppers, etc.

15. A co-polymer of PVC is now extensively used in the manufacture of gramophone records.

Polyethylene or Polythene

16. A colourless wax-like plastic, very stable and inert to most liquids. This was an Imperial Chemical Industries (ICI) discovery and the original process consisted of polymerization of ethylene gas at elevated temperature ($200^{\circ}C$) and high pressure (30,000 pounds per square inch). Production started in 1938 and its electrical properties were just those required for radar. Consequently, during the war years, this plastic was used exclusively for this purpose. More recently, however, it has been used for squeeze bottles, large blow mouldings, tubing, agricultural irrigation pipes, and household goods such as pails, cups and bowls and packaging films.

17. Low pressure polythene is made by polymerization at atmospheric pressure and only slightly elevated temperature activated by a catalyst. It has a higher softening point than high pressure polythene. It can be repeatedly exposed to temperatures of 250°F and, consequently, vessels and articles made from it can be sterilized. It has a surface comparable to that of polystyrene and the feel of nylon, with the added properties of high impact strength.

18. In the East African sub-region, only a small proportion of low pressure polythene is in use, although polythene constitutes almost 40 per cent of the total consumption of plastics.

Polystyrene

19. Polystyrene is a hard material with very good electrical insulation properties. It suffers from two disadvantages. It is softened by boiling water with the result that articles may be distorted under ordinary domestic conditions. The other disadvantage is its inherent brittleness. These are already overcome in the co-polymers which are alloys of styrene, butadiene and acrylonitrite polymers.

20. Its advantage is its cheapness and, for this reason, 60 to 70 per cent of all injection moulded articles are made from various brands of polystyrene. Examples of moulded articles are: toys, jewellery, handles; stoppers and covers for tubes and containers; bottles, boxes, eating and drinking utensils; brushes, combs, zippers, insulating parts, telephones.

21. Expanded polystyrene is used for the manufacture of insulation boards for cold cabinets and heat-proofing of buildings.

Other Thermo-softening Plastics

22. Of the others listed, only the urethanes used in the manufacture of sponges, foam cushions and mattresses are of any importance to this sub-region. The polyamides, e.g., nylon, find application in the fish net and textile industries and in the production of rope and twine. The polyacrylates, e.g., Perspex, are imported in sheet form for fabrication into boxes and for making signs, etc.

Thermo-hardening Plastics

23. These plastics, also referred to as thermo-setting, undergo a chemical change in the course of manipulation at high temperatures which "sets" them so that they no longer re-soften with heat. These plastics can therefore be manufactured only once and the scrap cannot be reused.

24. The three main families of thermo-hardening plastics are:

a. phenolic plastics, which include the condensation products of a phenol or related compound with formaldehyde;

b. aminoplastics, which include the condensation products of urea and formaldehyde and the melamine and formaldehyde;

c. the polyesters.

25. Phenolic plastics, which are resins with up to 50 per cent filler, are used as moulding compositions. They are used in the manufacture of buttons, handles for furniture and utensils, knife handles; electric lamp sockets, plugs and switches; knobs; grinding wheels, spools, bobbins and couplings. In laminates the phenol formaldehyde resins are used, but tend to discolour and for this reason the u.f. (urea formaldehyde) and melamine resins are preferred.

26. Urea plastics made of resin admixed up to 40 per cent with cellulose, wood flour, asbestos fibre and rock flour as fillers, are used in manufacture by compression moulding, of light coloured screw caps, sanitary articles and household goods. The resin is used in laminates of wood, such as in plywood and table top compositions.

27. Melamine plastics have the same advantages in regard to color and light resistance as urea plastics. It is, however, superior to u.f. in mechanical strength and water resistance. They are used mainly in the production of table ware. The resin is used in plywood manufacture and in wood gluing.

28. The most important application of polyesters is in the form of reinforced articles, the most common reinforcement being glass, as woven cloth or unwoven glass mat. As no pressure is required, all sorts of complicated shapes can be fabricated with simple equipment. It has high impact strength and does not dent. The reinforced polyester is used for the manufacture of suitcases, boats, corrugated roof-lights, car bodies, etc.

CHAPTER III

THE PRESENT STATE OF THE INDUSTRY

29. The main consumption of plastics in the East African sub-region is in the manufacture of shoes, piping, extruded film potting pockets and packaging material, flexible hose and tubing, irrigation hard pipes replacing conventional galvanized iron and aluminium piping, electric wire and cable, table ware replacing ceramics and pottery, and sponge and foam pillows and upholstery. Use of the calender for the manufacture of PVC and polythene sheeting as curtain materials and for conversion to waterproof capes, raincoats, etc., is not evident. The manufacture of blow-moulded bottles, large containers, and squeeze bottles for the cosmetic and pharmaceutical industries is envisaged.

30. Polythene films of various sizes are much in demand as packaging material, as pockets for nursery plants and as lining for sacks and paper bags, and these are manufactured in almost every plastics factory, except those involved in shoe production. The factories making film also manufacture flexible hose and tubing from PVC, and hard PVC and polythene irrigation pipes. No factory exists for the manufacture of pipe fittings such as bends, tees, nipples, plugs, adaptors, etc.

31. The largest part of PVC is processed into sandals and shoes, and expansion of footwear production is planned in Malawi, Zambia, Uganda, Madagascar, Tanzania, Rwanda, Burundi and Somalia, and consumption of PVC is likely to rise steeply in the next few years.

32. In most advancing countries, the range of injection and compression moulded goods is extremely large. These constitute electrical accessories, table ware, kitchenware, carrier bags, lamp shades and lamp stands, canisters, radio cabinets, buckets, bowls, toys, larder boxes and numerous others. The range of production in the sub-region, except in Rhodesia, is limited to combs, soap boxes, cups, tumblers and small items and in these are not included electrical accessories such as plugs, sockets, switches, lamp holders, adaptors, etc., toothbrushes, lamp shades, toys

and novelties. Larger items, such as shopping baskets, buckets, large basins and bowls, radio cabinets, lamp shades of various designs, plastic frames, etc., are not being manufactured as yet, although several firms indicated expansion to these items.

33. The requirements of insulated wire and cable, both for electrical and other uses,are sufficiently large to sustain factories for this production in at least four or five countries, but the only production is in Rhodesia in two factories. One other factory is due to be established in Kenya. Ethiopia has one factory for the manufacture of the simpler cables. The market is still large enough to support one factory each in Tanzania, Madagascar and Zambia.

34. The present annual consumption of PVC and polythene as indicated by manufacturers in these countries is as follows:

Table 1

Country	Production in metric tons	
	PVC	Polythene
Ethiopia	300	20
Kenya	300	800
Uganda	100	50
Tanzania	280	430
Madagascar	300	100
Burundi	200	—
Zambia	400	200
Rhodesia	1,600	2,000
Total	3,480	3,600

35. The actual imports of plastic materials in the raw form into the following countries during 1960-63 were as follows:

Table 2

Country	Unit	1960	1961	1962	1963
Kenya	Metric tons	497	974	955	1,698
Uganda	Metric tons	95	123	118	174
Tanzania	Metric tons	272	459	607	1,268
Ethiopia	Metric tons	n.a.	n.a.	248	251
Rhodesia and Zambia	Metric tons	2,086	2,531	2,925	5,754
Mauritius	Metric tons	11	32	19	37
Madagascar	Metric tons	290	211	305	423
Reunion	Metric tons	n.a.	n.a.	154	153
Total		3,251	4,330	5,331	9,758

36. It will be seen that there has been a 200 per cent increase in consumption of plastics from 1960 to 1963. On this basis, the projected consumption of 20,000 tons by 1970 seems conservative. This projection is based, however, on certain factors. Plastics, unlike rubber, have no single major use. They are also extremely light. Increase in consumption entails not a few units specializing in a few products, but the enlarged production of a very large number of items. The consumption of PVC in Tanzania is only280 tons; yet, the shoe production, largely in plastics, is over one million pairs. A wire and cable factory producing 12 million yards of flex wire, single eighteen cable, and cables up to 7/044 will only require 170 tons of PVC. Rhodesia expanded manufacture to meet the markets of Zambia and Malawi, and has possibly already reached saturation, except in regard to plastic floor tiling and a small range of electrical and motor accessories. Similarly, Kenya attempted to meet the markets of Uganda and Tanzania by increased production capacity during the last five years.

37. Malawi and Somalia have no production as yet and, until recently, the factories in Zambia were shadow units of parent organizations in Rhodesia. Expansion of production of plastic goods will be principally in the countries where this industry has made little impact, such as in Madagascar, Zambia, Uganda, Ethiopia, Reunion, Mauritius, Burundi, or in countries where it will be a new industry, such as in Malawi, Rwanda and Somalia.

CHAPTER IV

PLASTIC GOODS MANUFACTURE DEVELOPMENT BY 1970

Plastic Footwear

38. It has been estimated that the total demand for shoes of all forms - leather, canvas and plastic - in the sub-region in 1970 will be 27.8 million pairs. The 1965 production is estimated at 14.4 million (vide "The Development of Rubber Goods Manufacture in the East African Sub-region", Document E/CN.14/INR/92). Of the shortfall of 13.4 million pairs, at least 20 per cent will be of plastic shoes.

39. New production of plastic shoes is envisaged in Somalia, Malawi, Madagascar, Reunion and Mauritius. The present production in Uganda and Zambia is totally inadequate to meet the demand. Zambia and Malawi are principally supplied from Rhodesia, while Uganda's needs are being met from Kenya and Tanzania. Mauritius imported almost a million pairs of shoes in 1960, but its average demand is of the order of 800,000 pairs, and a single unit making 200,000 pairs of plastic injection moulded shoes is viable in Mauritius, Malawi and Reunion and possibly two or more units or a larger factory combined with rubber-canvas and leather snoes in Zambia, Uganda, Madagascar and Ethiopia. The total additional production required by 1970 is 2.7 million pairs, made up as follows: Zambia, 400,000; Uganda, 400,000; Tanzania, nil; Somalia, 200,000; Rwanda and Burundi, 200,000; Mauritius, 200,000; Malawi, 200,000; Madagascar, 600,000; Kenya, 300,000; Ethiopia, 200,000.

Insulated Electric Wire and Cable

40. The data on imports of insulated wire and cable are not available for Somalia, Ethiopia and Reunion, or separately for Zambia and Malawi. Rhodesia has two factories manufacturing electric wire and cable and the imports shown are presumably the unsatisfied demand in Zambia and Malawi.

Table 3

Insulated Wire and Cable Imports (1962 and 1963)

Quantity = Centals

Value - US$ '000

Country	1962			1963		
	Quantity	PVC Content Estimated Centals	Value	Quantity	PVC Content Estimated Centals	Value
Rhodesia, Zambia and Malawi 1/	85,352	40,000	2,629	63,314	30,000	1,998
Madagascar	9,458	4,600	495	9,724	4,700	524
Mauritius	7,062	3,400	288	8,250	3,700	378
Tanzania	8,000	4,000	335	13,000	6,000	480
Uganda	4,000	2,000	185	8,000	4,000	325
Kenya	19,000	8,000	711	19,000	8,000	763
Total	132,872	62,000	4,643	121,288	56,400	4,468

1/ The imports into the Federation in 1960 and 1961 were 138,457 and 126,672 centals, respectively.

41. Most of the countries of the sub-region, with the possible exception of Somalia and Rwanda, have expanded power production through hydrel schemes. The Kariba Dam project in Rhodesia is expected to give an additional 1600 MW, the Seven Forks Scheme in Kenya an additional 270 MW and the Owen Falls and Victoria Falls schemes have raised power production in Uganda to 150 MW. Other countries have increased hydrel power production through minor schemes. The total installed capacity in the sub-region at present is around 2,000 MW. Both power production and consumption have increased at a high rate. The consumption of wire and cable in the sub-region was 6,000 tons in 1963, and the output of two factories already established in Rhodesia. The unsatisfied demand at present is estimated at 8,000 tons of wire and cable or the equivalent of 4,000 tons of PVC.

42. With the technical and financial participation of a reputable UK manufacturer, Kenya is shortly establishing a wire and cable factory. A small unit, unfortunately without technical collaboration and adequate quality control, exists in Ethiopia. It is our view that additional units in Zambia, Tanzania and Madagascar should be established with capacities of 600 - 1,000 tons of cables per year on each unit.

43. As a major producer of copper, it is hoped that Zambia will supply electrolytic copper drawn into standard 3.2 mm wire to all the factories of the sub-region, and that each factory will possess wire drawing and stranding machinery to draw standard wire to the special requirements of each cable.

Floor Tiling

44. Although wooden parquet flooring is available in some countries at modest cost, the plastic tile and sheet have become extremely popular for floor covering. Most of the popular brands are made of PVC and asbestos. The demand in Rhodesia alone in 1961, a lean year for building, was 1,000 tons. The present market for plastic tiles in the sub-region is around 3,000 tons, and three factories for the manufacture of plastic tiles are viable. It is suggested that one factory be established in Rhodesia, which has a large market, and the other two in Ethiopia and Uganda.

Foam Plastics

45. The manufacture of plastic sponge, cushions and mattresses has been popular and factories for production of foam plastics exist in Ethiopia, Kenya, Zambia and Rhodesia. A new unit is to be established in Madagascar. The existing plants of isocyanate foam are not working up to full capacity, largely due to limited markets. The scope for the establishment of additional units is limited and countries will be advised to make detailed market studies before investing in new production.

Insulation Boards

46. Expanded polystyrene formed into ceiling boards, partitioning blocks, insulation for refrigerators and cold cabinets and for packaging of glass and delicate instruments, etc., is finding increased uses in the sub-region.

Two factories, one in Rhodesia and the other in Madagascar, exist, but additional units are indicated as subsidiaries of existing plastic factories.

Blow-moulding

47. Blow-moulded products, such as squeeze bottles, large bottles and containers are easy to manufacture and the machinery required is also of low cost. Yet none of the existing factories have embarked on this production. One unit is to be established as part of an existing plastics factory in Madagascar and will produce bottles for the packaging of wine and vegetable oils.

48. Blow-moulding offers wide scope and can be established as part of the plastic moulded factories in every country of the sub-region.

Electrical Accessories

49. These will include plugs, sockets, lamp holders, switches, adaptors, ceiling roses, lamp brackets, etc. With the high rate of power development and building activity, it is surprising that no production exists of electrical accessories in the sub-region. While detailed figures on imports into each of the countries of the sub-region are not available, the over-all estimated demand of the sub-region is sufficiently large to support two independent factories. Brass and porcelain components may have to be imported initially, but later manufactured within the sub-region.

Injection Moulding

50. Table ware and household ware such as bowls, tumblers, plates, basins and buckets are still not being manufactured in adequate quantities to meet demand. Most of the factories that exist specialize in smaller items such as combs, soap cases, rulers, ballpoint barrels, etc. Tanzania is due to establish a radio assembly plant and similar plants are also contemplated in Zambia, Ethiopia and Uganda. The manufacture of radio cabinets and other parts of the radio should form part of the existing plastic factories and of new units to be established.

CHAPTER V

SUMMARY OF RECOMMENDATIONS AND CONCLUSIONS

51. The plastics goods manufacturing industry in the sub-region consumed approximately 10,000 tons of base plastics, of which PVC and polythene constituted 7,000 tons. The industry is expanding production of existing range of goods and also into new products hitherto not manufactured. The survey indicates that the main expansion that has taken place, except in the field of shoes, has been concentrated in two countries, Rhodesia and Kenya. Several other countries - Ethiopia, Tanzania, Zambia, Madagascar and Uganda - have made modest advances. The units in existence in these countries are shown in the Annex.

52. Although the growth rate of this industry has been high in the last five years, this study allows only for a modest 100 per cent increase from 1963 to 1970, and the consumption of 20,000 tons per year by 1970. It is suggested that, as plastics have no single major use and increased consumption entails manufacture of a large range of products, a higher rate of growth may not be achieved.

53. The largest increase in consumption of PVC would be in the manufacture of 2.7 million pairs of shoes (estimated 3,000 tons). This production is recommended in nine countries, five of which - Ethiopia, Rwanda, Burundi, Malawi and Somalia - will establish new units, while others may expand existing units or establish separate units.

54. Insulated wire and cable factories, using principally plastic insulation and also other insulation such as rubber, if necessary, are recommended in four countries - Zambia, Tanzania, Madagascar and Kenya. The consumption of plastics in this new production is estimated at 2,000 tons. Zambia is one of the largest producers of copper and it is only natural that the requirements of annealed electrolytic copper wire of 3.2 mm for all factories in the sub-region should come from that country. No wire drawing factories exist in Zambia at present and their establishment should receive high priority and precede the wire and cable factories.

55. Floor covering, both as sheet and tile, is not produced in the sub-region and four factories, either as separate units or as expansion of factories in related manufacture, are recommended in Rhodesia, Zambia, Tanzania and Uganda. This production requires heavy calenders and the same equipment can be used for plastic sheeting for conversion into rainproof wear, curtains, etc.

56. Electrical accessories are not manufactured in the sub-region and two factories are recommended - one in Rhodesia and the other in Tanzania.

57. These and other products recommended for manufacture in the countries of the sub-region are shown in chart form.

CHART OF UNITS RECOMMENDED AND EXISTING

Country	Shoes	Wire and Cable	Floor-ing	Foam	Insula-tion Boards	Blow Mould-ing	Injection Moulding: Electri-cal Ac-essor-ies	Poly-thene film	Extru-sion soft and hard	Small	Large Components
Ethiopia	X	A	X	A	X	X	0	A	A	A	X
Kenya	X	X	0	A	X	X	0	A	A	A	X
Madagascar	X	X	0	B	A	X	0	A	A	A	0
Malawi	X	0	0	0	0	X	0	X	X	X	0
Mauritius	B	0	0	0	0	X	0	X	X	X	0
Rhodesia	A	A	X	A	A	X	X	A	A	A	A
Rwanda and Burundi	X	0	0	0	0	X	0	X	X	X	0
Somalia	X	0	0	0	0	X	0	X	X	X	0
Tanzania	A	X	0	X	X	X	X	X	A	A	X
Uganda	X	0	X	X	X	X	0	A	A	X	X
Zambia	X	X	0	A	X	X	0	A	A	A	X
Total New Production	2.7 mil. pairs	6,000 tons	3,000 tons	100 tons	500 tons	300 tons	200	50	450	500	1,000
Plastic Con-sumption in tons	3,000	2,000	1,500	100	500	300	100	50	450	500	1,000
No. of New units or expanded units	9	4	3	2	5	11	2	5	4	5	5

A = Units existing

B = Production tooled and ready

X = New Unit or expansion recommended

0 = No unit recommended

ANNEX

Inventory of Plastic Factories in the East African Sub-region

The inventory which follows is not a complete record of all factories which process plastics into various products. As far as we are aware, there are no units in Malawi and Semalia. Burundi is reported to have a production capacity of 200 tons per year and it is presumed that the plastics unit is producing both irrigation pipes and polythene films. All countries in the sub-region are, however, planning expansion of plastic goods production and the consumption of plastics in the sub-region by 1970 may be as high as 20,000 tons.

Present consumption of PVC in the sub-regions is 3,500 tons and that of polythene 3,600 tons per annum. The major consumer is, however, Rhodesia with 1,600 tons of PVC and 2,000 tons of polythene. The next large consumer is Kenya with 300 tons of PVC and 800 tons of polythene.

ETHIOPIA

1. Ethio-Plastics Limited, P.O. Box 318, Addis Ababa

   Manufacture gumboots knee-length, capacity 800 pairs per day using PVC; insulated PVC wire and cable; machinery installed for polythene film; hard PVC pipes.

2. Talab Plastic Works, Asmara

   Injection moulded hollow ware.

3. Bini Raffa Ello, Asmara

   PVC moulded shoes.

4. Calzaturificio Bini, Asmara

   PVC shoes.

5. Ethiopian Foam Plastic Industry, Addis Ababa

   Foam plastics only at present; sponsors intend to expand to injection moulded household ware.

KENYA

1. Plastics East Africa Limited, Thika Road, P.O. Box 30101, Nairobi

   The largest manufacturers of polythene film of various sizes, soft and hard PVC piping; compression moulding; injection moulding.

2. Kenya Foams, Mombasa

   Polyisocyanate foam and sponges.

3. National Shoe Company, P.O. Box 30219, Nairobi

   Injection moulding of plastic shoes.

4. United Manufacturing Company

   Injection moulding of plastic shoes.

5. East African Records Limited, P.O. Box 30256, Nairobi

   Gramophone records originally made from shellac are now exclusively made from PVC co-polymer.

6. Kenya Aluminium and Industrial Works Limited, P.O. Box 921, Mombasa

   Plastic hollow ware.

7. East African Bata Shoe Company Limited, P.O. Box 23, Limuru

   Plastic shoes.

8. Ideal Casements (EA) Limited, P.O. Box 5319, Nairobi

   Plastic louvres.

9. Polypens, Nairobi

Manufactures ball point pens.

10 Pan Plastics, Mombasa

Polythene films.

11. Meta Plastics, Mombasa

Polythene films.

MADAGASCAR

1. Saint Freres Ocean Indien, Tananarive

Polythene film; expansion to blow-moulding of bottles for wine and oils already tooled.

2. Comeplast, Tananarive

Soft and hard PVC tubing, hose and irrigation pipe; small production of polythene film; polystyrene insulation boards; fibre glass and polyester lined to metal boats.

RHODESIA

1. Insulation Boards

Stramit Central Africa (Pvt) Limited, P.O. Box 2884, Salisbury
Foamed polystyrene insulation boards.

2. Electric Wire and Cable

a. Rhodesian Cables Limited, Lytton Road, P/Bag 144 H, Salisbury
Plastic power cables; also copper rod, wire and strand.

b. Aycliffe Cables (Rhod) (Pvt) Limited, Lytton Road, Salisbury
Plastic cables; insulation tape; insulated cables.

3. Plastic Covered Wire - Fabrication

a. Wiro-Plastics (Pvt) Limited, P.O. Box 1774, Salisbury
Wire baskets, waste paper baskets, clothes driers, chicken batteries, dish driers, display stands, letter-trays, self-service trays.

4. Plastic (PVC) Coated Hessian and Bags

a. Ferguson Shires (Rhodesia) Limited, 6, Vumba Road, Umtali
Plastic coated hessian and felt.

b. Rhodesian Bag Manufacturing Company (Pvt) Limited, P.O.Box 1808, Bulawayo
Plastic coated bags.

5. Waterproof Clothing from Plastics

a. Saltrama Plastics, 110 Lytton Road, P.O.Box 2139, Salisbury

6. Polythene Bags

a. Benatar (Pvt) Limited J.J., P.O. Box 559, Salisbury

b. Metal Containers (Rhod. Pvt) Limited, P.O. Box 193, Salisbury

c. Polythene Piping (Pvt) Limited, P.O. Box 2235, Salisbury

d. Saltrama Plastics, 110 Lytton Road, P.O. Box 2139, Salisbury

7. Ballpoint Pens and Pencils

a. Scripto of Rhodesia (Pvt) Limited, P.O. Box 2185, Salisbury.

8. Radio Cabinets and Accessories

a. Electrical Radio and Musical Industries Limited, P.O. Box 1449, Bulawayo

b. Philips Rhodesian (Pvt) Limited, P.O. Box 994, Salisbury

c. Premier Electric (Pvt) Limited, P.O. Box 617, Bulawayo

d. Radio Development of Rhodesia, 5727 Bloomfield Road, P.O. Box 8183, Bulawayo

e. Supersonic Radio Manufacturing Company (Pvt) Limited, P.O.Box 8096, Belmont, Bulawayo

9. Miscellaneous - Polythene Bags and Films; Extrusion PVC, Polythene Hard and Soft; Injection Moulding; Vacuum Shaping

a. Saltrama Plastics Limited, P.O. Box 2139, Salisbury
Hose; wallets and purses; belts and buckles; waterproof clothing; plastic bags printed, sheeting, flexible piping

b. Polythene Piping (Pvt) Limited, P.O. Box 2235, Salisbury
Garden hose, hard irrigation pipes; planting pockets; polythene sheeting; tumblers

c. Plastics by Berwick Limited
Containers, chair feet, nameplates, pillboxes, extrusions and mouldings

d. Prodorite (CA) (Pvt) Limited
Tubing, extrusion, mouldings; transparent roofing sheets

e. Plastex Products (Pvt) Limited
Plastic extrusions, mouldings.

10. Buttons

a. Rhodesian Button Manufacturing Company (Pvt) Limited, P.O. Box 8152, Belmont, Bulawayo
Manufactures buttons, buckles and belts.

TANZANIA

1. Tanganyika Tegry Plastics Limited, 18 Pugu Road, P.O. Box 2219, Dar-es-Salaam

   Injection moulding including sandals up to capacity of 1 kilo. Polythene film extrusion: Hose pipe flexible in extruders, 30, 60 and 90 mm.

   Expansion intended: Blow-moulding of bottles, etc.; injection moulded products of large size, such as buckets, shopping baskets up to 2½ kilo weight, drinking straws, vacuum forming, electric wire and cable, added production of extrusion and particularly hard PVC pipes.

2. Simba Plastics Company Limited, 16 Kisarawe Street, P.O. Box 2459, Dar-es-Salaam.

   Polythene films, extrusion of hard pipes, plastic shoes; injection moulding of hollow ware.

3. East African Bata Shoe Company, Limited, Pugu Road, Box 42, Dar-es-Salaam

   Plastic shoes manufactured in Unipak and Hipak - present production 5,000 pairs per day.

UGANDA

1. Universal Plastics, Tororo

   Corrugated roofing sheets of acrylic esters; hard PVC pipes.

2. Muljibhai Madhvani and Company, Jinja

   Polythene filsm - largely to pack confectionery manufactured by this enterprise.

3. Plastic Shoes East Africa Limited, P.O. Box 74, Tororo

   Injection mould PVC shoes.

4. Fit Right Manufacturers Limited, P.O. Box 768, Kampala

   Leather shoes with plastic welded soles and all-plastic soles of PVC.

5. Uganda Fish-net Manufacturers Limited, P.O. Box 3025, Kampala

   Manufactures fish nets from imported nylon filament

ZAMBIA

1. Lusaka Plastics, P.O. Box 1663 Lusaka

   Polythene films both large and small; extruders 30 mm and 90 mm; extrusion of soft and hard PVC goods - harden hose and tubing and irrigation pipes; vacuum formed L signs.

2. Engineering Sales and Service Limited, P.O. Box 518, Kitwe

   Plastic extrusions and mouldings; plastic signs.

3. Athol Plastics (Pvt) Limited, Kitwe

   Injection moulded articles, including buckets and miners helmets.

4. Prodorite (Zambia) Limited, P.O. Box 1707, Kitwe

   Plastics tubing.

5. Vitafoam (Ndola) Limited, Ndola

   Plastic foam.

6. J & H Plastics, P.O. Box 538, Chingola

   Polythene film.