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04501

PROJECT

REPAIR AND MAINTENANCE OF INDUSTRIAL EQUIPMENT IN THE DEVELOPING COUNTRIES

FIELD-SURVEY REPORT ON KENYA

ITALCONSULT

Rome, March 1969

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SUMMARY

A preliminary one-month survey was carried out in Kenya by a two-expert Italconsult team, on behalf of UNIDO. Its scope was to assess the present efficiency and the future needs for improvement of maintenance and repair services of existing manufacturing equipment.

A list of properly selected firms to be surveyed was prepared, so that within the allowed limits of time the Mission could obtain an overall idea of the problem both in the main districts and groups of activity.

While it is difficult to draw general conclusions, the survey has shown that in general the manufacturing firms solve their maintenance and light repair needs by recourse to their own facilities while using to a varying extent outside workshops for their major repairs. However both in-plant and outside facilities are not very reliable and are highly expensive. The main reasons for this seem to be a very marked lack of skilled maintenance supervision and labor; poor efficiency of the physical repair facilities; a serious shortage of spare-parts; and, in general, not very efficient stock storage and control methods. The problem is said to be substantially aggravated by excessive delays in Customs clearing operations and inland transport. The geographic location and the industrial concentration of the different provinces do, of course, tend to make these problems more or less acute.

A program of implementation is suggested providing for:

- short-term assistance by a 4-man team on a 12-month assignment;
- long-term assistance the details of which are difficult to envisage at the moment; as a tentative estimate however it is thought that a 6-m man team on a 2 to 3 year assignment would be involved.

The short-term assistance should be aimed at effectively solving the main relevant problems of a few selected important firms, and at carrying out a preliminary project for a central pilot workshop in an outlying district. The long-term project should aim at providing an overall solution for all the different aspects of the problem and on a nation wide scale.

Counterparts from the assisted firms and from the Ministry of Commerce and Industry should be attached to the UNIDO teams, so that the nucleus of an efficient

staff can be prepared for future Managerial Consulting Centers both at Ministry level and at the E.A. Association of Industries as well.

It is expected that the implementation of the whole program would make an important contribution to the Country's industrial development.

1. INTRODUCTION

The United Nations Industrial Development Organization plans to engage in a long-term campaign for the improvement of maintenanc. and repair services for existing industrial equipment in the developing countries.

In order to get an initial idea of the problems involved in such campaign, a preliminary sample survey of some representative countries has been made.

The objectives of the envisaged field studies were mainly:

- to enable UNIDO to choose the countries in which to start the implementation of the campaign
- to identify the crucial fields in the surveyed countries, in which assistance is urgently needed
- to help UNIDO to formulate a long term working program in the field of repair and maintenance both for the chosen countries and for developing countries in general.

Field surveys for a grou[illegible] of countries comprising Kenya, UAR and Somalia were assigned to Italconsult, Rome, under contracts 68-1 and 68-6.

The present report refers to the field survey carried out in Kenya from December 5, 1968 to January 3, 1969 by a Mission of two Italconsult experts.

The Mission wishes to acknowledge the cooperation it received from the various Ministries, Institutions and private individuals who helped provide information and data for the survey.

2. PRELIMINARIES

According to terms of reference and to the additional instructions received during the briefing in Vienna, the field-survey was to be carried out on the following general lines:

- The survey was to be limited to Manufacturing Activities (divisions 2 and 3 of the ISIC code, rev. 1).

- The groups of such activities represented in the Country were to be identified and graded according to their importance in the national economy and in the field of exports.

- A convenient number of firms was to be selected from each group and surveyed in the field, in order to get an overall picture and understanding of the group's present operating conditions especially as concerns maintenance and repair of existing equipments.

- Suggestions were to be put forward for future implementation of the UNIDO's project.

Thus the preliminary step was to make an overall analysis of the country's industrial structure. This was done by contacting officers of the Ministry of Commerce and Industry; the Ministry of Economic Planning and Development, Statistics Division; the Association of E.A. Industries; the Financial Development Corporation of Kenya, and the Ministries of Labor and of Education, as far as the problem of training was concerned, (it soon emerged that this is an important limiting factor).

It was also decided to extend the survey to cover farm mechanization problems, since these to some extent involve food manufacturing activities, one of the most important groups both as regards the country's economy and its exports.

The overall structure of Kenya's manufacturing activities along with economic and export features are clearly shown in Tables 1 to 4. The figures reflect the situation in 1966 and 1967, but this has now changed somewhat in a number of specific fields. The most important of these changes will be pointed out in the appropriate chapters of the General Report.

The appendices provide detailed reports on the infield surveys. Every attempt was made by the Mission to use these surveys to obtain as much data as possible having a

Table 1

NUMBER OF FIRMS BY SIZE, 1966

ISIC Code Rev. 1	Industry	Size (Number of Employees) 0-9	10-19	20-49	50 & over	Total
	Manufacturing and Repairs					
20	Food manufacturing	170	44	46	30	290
21	Beverage industries	12	4	4	8	28
22	Tobacco manufacturing	–	–	–	1	1
23	Textile manufacturing	6	4	12	16	38
24	Footwear, clothing and made-up textiles	442	19	14	12	487
25	Wood and cork excluding furniture	26	8	8	28	70
26	Furniture and fixtures	138	19	15	9	181
27	Paper and paper products	3	1	5	5	14
28	Printing, publishing and allied industries	36	24	29	8	97
29	Leather and fur products	3	2	2	2	9
30	Rubber manufactures	4	2	2	2	10
31	Chemicals	23	19	12	15	69
32	Products of petroleum and coal	–	–	–	1	1
33	Manufacture of non-metallic mineral products	10	9	8	9	36
35	Metal products except machinery and transport equipment	74	10	11	9	104
36	Machinery, non-electrical	16	15	11	4	46
37	Electrical machinery and appliances	32	7	2	1	42
38	Transport Equipment	191	44	47	25	307
39	Miscellaneous manufacturing industries	67	14	4	5	90
	TOTAL	**1,253**	**245**	**232**	**180**	**1,920**

Source: Statistical Abstract 1967 (Statistics Division, Ministry of Economic Planning and Development) – Table 65 *(a)*.

Table 2

NUMBER OF EMPLOYEES BY SIZE OF FIRMS, 1966

ISIC Code Rev. 1	Industry	Number of Employees				
		0-9	10-19	20-49	50 & over	Total
	Manufacturing and Repairs					
20	Food manufacturing	642	584	1,382	13,344	15,952
21	Beverage industries	46	57	125	2,338	2,566
22	Tobacco manufacturing	–	–	–	994	994
23	Textile manufacture	24	67	362	5,632	6,085
24	Footwear,clothing and made-up textiles	1,269	249	362	5,079	6,959
25	Wood and cork, excluding furniture	110	107	253	3,775	4,245
26	Furniture and fixtures	503	247	436	3,366	4,552
27	Paper and paper products	18	12	190	800	1,020
28	Printing, publishing and allied industries	177	310	884	1,502	2,873
29	Leather and fur products	20	35	51	211	317
30	Rubber manufactures	24	37	47	181	289
31	Chemicals	103	289	442	2,716	3,550
32	Products of petroleum and coal	–	–	–	230	230
33	Manufacture of non-metallic mineral products	31	126	281	1,724	2,162
35	Metal products except machinery and transport equipment	258	147	356	3,340	4,101
36	Machinery,non-electrical	77	223	396	394	1,090
37	Electrical machinery and appliances	129	103	91	310	633
38	Transport equipment	683	559	1,432	4,514	7,188
39	Miscellaneous manufacturing industries	193	208	95	562	1,058
	TOTAL	**4,297**	**3,260**	**7,165**	**51,912**	**65,634**

Source: Statistical Abstract 1967 (Statistics Division, Ministry of Economic Planning and Development) – Table 64 *(b)*.

Table 3

SURVEY OF INDUSTRIAL PRODUCTION, MANUFACTURING (1965)
(K£'000)

ISIC Code Rev. 1	Industry	Gross Production	Value Added	Net Output
	Manufacturing and Repairs			
201	Meat products	6,031.6	1,926.6	1,137.4
202	Dairy products	5,855.6	1,413.2	859.9
203	Canned fruit and vegetables	1,272.1	1,159.5	295.4
205	Grain mill products	7,671.9	2,083.6	1,841.6
	Bakery products			
207	Sugar	2,710.5	1,401.9	1,119.5
208	Sugar confectionery			
209	Miscellaneous foods	292.3	88.8	72.7
212	Spirits			
213-220	Beer, malt and tobacco	8,212.2	5,556.4	3,859.3
214	Soft drinks (mineral waters)	916.7	576.6	414.1
231	Textiles	2,082.5	789.2	545.2
233	Cordage, rope and twine	1,244.5	574.4	448.3
241	Footwear	1,677.9	901.1	885.1
243	Clothing and wearing apparel	1,440.7	400.9	323.9
251	Sawn timber	1,331.5	898.5	639.4
252	Other wood products	–	–	–
260	Furniture and fixtures	584.5	231.5	190.3
270	Paper and paper products	2,088.4	811.7	728.2
280	Printing and publishing	3,046.4	7,877.8	1,502.0
290-300	Leather and rubber products	563.1	254.2	176.8
311-320	Basic industrial chemicals and petroleum	4,264.1	3,325.6	2,643.4
313	Paints	853.6	359.8	186.1
319	Soaps	3,322.1	1,061.0	739.1
319	Miscellaneous chemicals	2,924.9	988.4	662.6
331	Clay products			
332	Glass products	788.5	601.8	525.6
334	Cement	3,039.0	1,853.1	1,610.5
339	Other non-metallic minerals	117.2	60.9	53.9
350	Metal products	6,037.3	2,045.3	1,649.5
360	Non-electrical machinery	440.0	229.3	199.1
370	Electrical machinery	1,919.2	1,365.8	1,286.7
381	Shipbuilding and repairs	905.2	661.9	583.1
382	Railway rolling stock	3,437.6	2,190.0	2,100.6
383	Motor vehicle bodies	674.6	293.2	241.3
384	Motor vehicle repairs	4,150.7	1,961.3	1,530.8
386	Aircraft repairs	1,431.2	679.3	620.5
399	Miscellaneous manufacturing	536.8	290.4	227.3
	TOTAL	**81,884.4**	**38,913.0**	**29,999.2**

Source: Statistical Abstract 1967 (Edited by: Statistics Division – Ministry of Economic Planning and Development) Table 87.

Note: The figures cover all firms employing 50 or more persons. The value added of manufacturing and repairs represented in 1965 about 11 % of the gross domestic product at factor cost (see Table 38a of the above quoted source).

Table 4

DOMESTIC EXPORTS OF PRINCIPAL MANUFACTURED COMMODITIES (ISIC GROUP 2-3) K£'000

Industry Group	1964	1965	1966
TOTAL NATIONAL EXPORTS	**47,116**	**47,173**	**58,073**
TOTAL DOMESTIC MANUFACTURED EXPORTS	**16,488**	**17,889**	**21,284**
Food, Beverages, Tobacco	*5,037*	*4,486*	*5,208*
– Meat and meat preparations, total	2,167	2,468	2,994
– Milk and cream	114	69	119
– Butter and ghee	754	293	392
– Maize milled	54	–	–
– Pinapples, tinned	874	775	535
– Beans, peas, lentils	521	475	577
– Feeding stuffs for animals	278	224	396
– Other foods	243	162	174
– Beverages and tobacco	32	20	21
Basic Materials, Mineral Fuel and Lubr.	*6,182*	*8,657*	*10,389*
– Oil seeds and oil nuts	460	449	506
– Timber (rough or simply worked)	256	272	210
– Cotton, raw	648	747	869
– Pyrethrum extract	2,167	1,964	2,397
– Petroleum products	2,160	4,670	5,882
– Other not stated above	452	502	486
– Animal and veg. oils and fats	39	53	39
Manufactured Goods	*4,189*	*4,550*	*5,787*
– Chemicals, total	1,845	1,767	2,949
– Leather	189	282	176
– Textile yarns, fabrics and made-up textiles	188	178	209
– Wood products	255	411	412
– Cement	802	939	843
– Glassware	60	66	113
– Steel doors and windows	85	58	53
– Aluminium ware, domestic	86	116	86
– Metal containers	88	49	69
– Machinery and transport equipment	118	57	85
– Footwear	77	136	203
– Printed matter	81	145	133
– Other manufactured goods	315	346	456

Source: Statistical Abstract 1967, Table 47a, Statistics Division, Ministry of Economic Planning and Development.

Note: Domestic exports are valued free on board ship or aircraft. The amount of any Kenya levy, cess or export taxes to which goods are liable is included in the value.

bearing on the points of major interest for the study underway. However, this endeavor was only partially successful. Very often reticence and sometimes lack of managerial expertise made it very difficult to obtain sufficiently reliable figures on the operational aspects of the problem. Indeed, at times, none at all were available.

However, right from the start of the surveys it became apparent that maintenance and repair service was a key factor in local industry.

Most of the managerial people showed a marked interest in the problems and questions posed by the Mission. In only a few firms, irrespective of their size, did the managers show no interest in the economics of their business or were reticent to admit failures of any kind in their operation. Even so it was not difficult to ascertain that they were a fairly high price for their lack of basic know-how on maintenance problems: excessive idle-time and/or excess nominal capacity, heavy spares inventory and high airfreight costs, costly and poorly-executed emergency repairs. A few examples may prove very illuminating in this respect:

- A 10,000 acre farm presently has 50 tractors of different types. The manager says that he could do with 50% less provided they were properly operated and maintained.

- The same farm employs 400 hands on sisal growing and processing. The decorticating operation is dependent on an old boiler whose tubes were scheduled for replacement 2 years ago. This boiler is continuously breaking down and, moreover, is in a dangerous state.

- A fruit canning line has a serious bottleneck since lack of maintenance has gradually reduced the capacity of its sterilizing oven by 33% of what it was originally.

- The laborforce on tractor assembly lines with experienced supervisors is 50% of that used on lines with inexperienced supervisors.

- The renewal of a steam network had to be done again after only a few months operation because pipes burst notwithstanding the fact that they were supplied as being in accordance with the appropriate British Standard Specification.

- Locally made screws, gears and castingsand other machinery components are very costly, not very reliable, many have to be discarded, and they do not usually last long.

In many cases it is not always easy to find and implement the solution to these problems. However, it is fairly evident that excess production capacity is provided in many cases to ensure smooth operation, and that prior to any expansion of physical productive facilities a good program of assistance is needed to enable the existing equipment to be run at full capacity.

The same appears true of the repair and maintenance workshops, spares stores and training facilities for all levels of maintenance and repair personnel.

The following points may be made regarding physical facilities for maintenance and repair:

- In-plant: generally limited to conventional day-to-day requirements and to special-purpose machinery which cannot be easily met outside. However, some large concerns are equipped so as to reduce outside assistance as much as possible.

- Outside: generally in line with local demand, but the shops are often too small, and not properly managed and kept in efficiency.

  As a consequence the work is often of poor quality and the prices high. There are few facilities for some special types of repairs, involving the instrumentation, automation, electrical and electronic sectors. There is no direct Government policy or intervention in this field.

  Even some of the most important and widespread motor vehicle firms – mainly represented by agents – generally do no more than overhaul and re-assemble, the repair of spares being subcontracted to the type of workshop described above. In some case, large concerns such as Shipyards, Railways and Harbors, and Power and Light workshops are often required to help other local industries, which they generally do when they can or are allowed to do.

- Very heavy spares inventories (6-12 months) are generally carried, except by firms in the Mombasa area where order lead-times can be much shorter (being near the docks) and because better and more reliable outside facilities are available. It should be remarked that the major concerns (oil refineries, breweries and cement factories) in general require mostly structural steel, which is readily available. Imports of spares generally account for not less than 70-80% in value of the Country's spares consumption. The remainder are manufactured locally but it is generally thought that imported spares are

more economic, notwithstanding the high import costs and the very large amount of capital bound up in stocks. Be this as it may, the Mission considers that in many cases more sound operation of the engineering workshops and better understanding of the costs involved in carrying such heavy inventories could reverse this position or at least bring about an improved balance. Improved Customs procedures and transport organization could be of great help, and the Government should be given assistance, if necessary.

– As far as the personnel is concerned, it may be stated that there is not enough skilled labor on the market to meet the local demand, and the problems is expected to become more acute as a consequence of the Africanization policy which is being implemented. The situation is further aggravated by the fact that a large part of the laborforce only has a background in traditional agriculture and herding, and has had no prior training either as regards basic education or at a vocational level. The transition from a rural to an industrial environment is a very difficult step, with a great number of problems of adaptation involved; and these are not easy to resolve without both general and specific educational measures. It is felt that the Africanization policy underway must be supported by an adequate educational program, especially since the general situation in no way encourages in-plant training schemes, while the output of the existing training centers seems to be lacking both in quantity and in quality. Plenty of training centers are at present in operation and more are being built. However their utilization and coodrdination should be improved to better meet the country's needs.

The geographical aspects of Kenya's manufacturing industry may be summarized as follows:

– The Nairobi area appears to be the most dynamic but it is also the most hard-pressed, as far as infrastructural services are concerned.

– Trends in the Mombasa area are probably more normal and the infrastructure is perhaps more reliable. This is doubtless due to Mombasa being a major regional port.

– The regions laying along the main railroad line from Nairobi through Naivasha and Nakuru up to Kisumu is mainly agricultural but there are

some most important concerns, mainly the chemical (Pyrethrum Processing Co.) and in the textile fields (Kisumu Cotton Mills). This is perhaps the region where improvement of workshop infrastructural services are most urgently needed. The same consideration may well apply to the region lying along the Nakuru-Eldoret-Kitale line.

3. REPORT ON THE SURVEY

The various points in this chapter have been itemized in strict accordance with the relevant points of Annex A para. III of the Contract.

In the case of the annexed statistical tables, an attempt has been made to group the different activities according to the ISIC code, rev. 1. However, this was not always possible, due to the different classification and aggregation criteria used by the Kenya Statistics Department. In this respect the Mission suggested that the Department might well come into line with the international classification. It was also recommended that an Industrial Census be made, following the "International Standards for Basic Industrial Statistics", a copy of which was provided with relevant recommendations.

3.1 IMPORTANT INDUSTRIES

a) The number and size of firms engaged in manufacturing activities is shown by major groups (2-digit level of ISIC) in Tables 1 and 2. The figures refer to 1966, and therefore they should be updated in some groups where new concerns have set up, or where old-established firms have expanded in the intervening years (sugar, textiles, wood, etc.), as a consequence of the implementation of the investment plan (see Table 5).

b) As far as age of the firms and other pertinent information is concerned, the following pointers generally hold good:

- In some traditional activities (food canning, tanning, saw-milling, etc.) where there has been little or no new investment recently, the concerns are, as a consequence, generally old established. They are mostly small in size (see Table 1) and hence their operations are characterized by their own particular features.

- In the new groups of activity (cement, petroleum and other chemicals, etc.) as well as in those groups where substantial new investments have been made (dairying, sugar, textiles, glass products, etc.) the firms are either newly established or in most

Table 5

PROJECTION OF CAPITAL INVESTMENTS IN THE MANUFACTURING INDUSTRIES
(in £ million)

Industry Group	Plan Projections					
	1965/66	1966/67	1967/68	1968/69	1969/70	Total
Food Processing						
Meat products	0.10	0.20	0.30	0.40	–	1.00
Dairy products	0.20	0.20	0.30	0.15	0.15	1.00
Grain milling including maize, wheat, rice, coffee, nuts, etc.	–	0.10	0.20	0.30	0.40	1.00
Sugar	1.50	3.20	1.50	0.10	–	6.30
Fruits and vegetables and misc. foods	0.15	0.25	0.40	0.60	1.00	2.40
Sub total	1.95	3.95	2.70	1.55	1.55	11.70
Non-Food						
Drinks and tobacco	0.10	0.60	1.00	–	–	2.00
Textiles and cordage						
Clothing, footwear and tanning	0.40	0.80	1.10	1.50	2.00	5.80
Pulp and paper	–	0.40	1.00	3.00	3.40	7.80
Other wood products (furniture, etc.)	0.05	0.10	0.25	0.35	0.45	1.20
Printing	0.10	0.15	0.20	0.25	0.30	1.00
Chemicals *(a)*						
Non-metallic minerals	1.00	1.00	2.00	2.00	3.00	9.00
Metal working *(b)*						
Miscellaneous industries	0.70	0.90	1.00	1.50	1.90	6.00
Sub total	2.65	3.95	6.55	8.60	11.05	32.80
Total (excluding cottage and small scale industries)	**4.60**	**7.90**	**9.25**	**10.15**	**12.60**	**44.50**
Mining and Quarrying						1.30

(a) Including soda ash etc.

(b) Excluding railway workshops

Source: Ministry of Ec. Planning and Dev. – Statistics Division.

cases, have been institutionally transformed. They are mostly medium or large-sized, have clear ideas of where they are going and enjoy sound, advanced management.

c) The importance of these industries in the national economy is shown in Table 3. This table gives the 1965 figures of output and value added, by group for the manufacturing activities. There are no more recent data available. The implementation of the afore mentioned investment plan has certainly altered some figures.

d) The importance in the export field for each group of manufacturing activities for the period 1964-66 is shown in Table 4. The same remarks as made in the above paras. could well apply in this case too.

e) As far as concerns type, age and condition of equipment in the different firms, detailed pointers are given in the reports of the individual firms surveyed (see Appendices). In general, these firms may be considered as fairly representative of the relevant groups. In this respect, however, similar remarks apply as in the case of 3.1 *b)*. In addition, Table 5 shows the projected capital investments for the main manufacturing groups; this will help the reader to better visualize the objective overall features.

3.2 EXISTING REPAIR AND MAINTENANCE PHYSICAL FACILITIES

a) In general, independent repair and maintenance sections (1) are only to be found in major firms, and in such cases they mostly have their own manager and try to limit as far as possible the need to call in external help. Smaller concerns tend to use outside workshops for part or most of their repair needs. A few special cases are to be found of small firms which contract out the whole of their repairs under special fixed conditions. The results are said to be quite satisfactory, but these are to be regarded as very special cases.

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(1) **In this report the expression "independent repair and maintenance sections" indicates inside workshops with their own managerial organization and control.**

Outside workshops are generally expensive, not completely reliable and seldom deliver the goods on time. The reasons for this are mainly to be found in the relative lack of skilled management, supervision and labor which are the very reasons hindering the efficiency of inside workshops. Nonetheless, outside repair worskshops are apparently in a better state to tackle such problems because of a higher and steadier level of activity and because specialization in the different trades is generally better.

Maintenance schedules are to be found fairly frequently in many firms of any size, but they are not so often correctly performed, especially in the medium and small sized firms. This seems to be particularly due to lack of maintenance education and of skilled labor.

b) Assuming that any workshop having a certain capacity, specialization and/or diversification of equipment, and mainly devoted to repair jobs comes under the definition of "centralized repair shop", then a fair number of such shops are to be found in Kenya. They may be divided into two groups: general workshops, either mechanical or electrical; and motor-vehicle workshops, mainly for cars, trucks and tractors.

The size, type and condition of equipment and quality of work vary over a fairly wide range. It may be stated, however, that viewed overall they only seem to be able to meet the demand to any extent in Nairobi and Mombasa. But this is not the case in minor towns where such ancillary services have not kept pace with industrial development, and repair workshops are in general neither very reliable nor diversified.

Except for special-purpose, technologically sophisticated spares and repairs, all other jobs can generally be done in the principal towns, but the quality is generally poor and the prices very high.

All of the facilities are privately owned, except those coming under the EAR & H and various Ministries, and those are not usually available to the manufacturing industries.

c) Though no import restrictions are enforced, availability of spare parts is scarce because of high overall importing costs and the excessive lenght of time required for delivery.

Special-purpose imported parts are generally stocked by the in-plant stores; stocks for 6 to 12 months being held. The same holds good for agency warehouses.

Any uncommon delay in deliveries or in placing orders directly affects the availability of spares on a nationwide scale. And this appears to happen not so seldom after the closure of the Suez Canal.

d) The present ratio of locally manufactured spares to total consumption is said to be barely 1:5. The quality of these spares is generally on the low side, and many cases were reported of parts having to be made several times before the correct result was obtained. This kind of thing is reported to happen even in the case of skilled workshops in the largest towns.

e) Fairly adequate organized stores are to be found only in the most important towns and mainly in the motor-vehicle sector. In the smaller towns there are some supply difficulties but these are not as bad as they might be because spares can usually be obtained at fairly short notice from the main agencies in the larger centers.

3.3 PREVAILING CONDITIONS OF REPAIR AND MAINTENANCE ACTIVITIES AND DIAGNOSIS

a) Present repair and maintenance facilities are not generally adequate, except in the case of a few large, well-managed, well-equipped firms located in the main industrial towns. Generally, firms use outside workshops which, not infrequently are inadequate and very expensive. Figures quantifying the magnitude of this inadequacy (lost production and idle time), are not readily available because of the reticence of many managers and becuase they are not always in the habit of thinking in terms of statistically important and meaningful figures. It should, perhaps, be pointed out that very often operational breakdowns may not have at present any direct effect on manpower idle time or on production schedules because many plants are presently run well under capacity depending on market demand or for other reasons.

Furthermore it should be noted that in many cases it is not so easy to give meaningful figures to such concepts as nominal capacity, excess

capacity, down-time and so on, since:

- continuous process lines are always so designed as to ensure very smooth operation through excess capacity or spare machinery in the most critical sections, especially in developing countries.

- plants designed for a very diversified range of production may have to meet production schedules which not infrequently call for partial or discontinuous operation of the different production lines.

A number of cases are however recorded in Chapter 2, showing very clearly the magnitude of losses due to lack of mainenance and repairs.

b) The problem of repair and maintenance seems to be particularly acute in the case of over-age sugar mills and textile factories, of motor-vehicles of any type, and of the repair workshops themselves, whose capacity is generally adversely affected by the inefficiency of their equipment. These latter are mostly over-age and out moded but they could meet most of the requirements much better if their equipments were properly maintained and operated.

In addition a major problem is to be found in the maintenance and repair of instrumentation, this lack being a serious obstacle towards a higher standard of automation, which is so important in the food and chemical industries.

c) It is felt that the factors affecting the adequacy of maintenance and repair facilities may be identified and graded as follows:

- training of supervision and labor in maintenance and repair;

- education and managerial thinking habits as far as the technical and economic aspects of maintenance are concerned;

- efficiency and sound operation of the existing repair facilities;

- lack of some special-purpose machinery and equipment such as gear cutters, grinding and boring machines, foundries, heat treatment facilities, material testing instruments, etc.;

– low poor-quality local production of spare-parts, which is to some extent a consequence of the factors mentioned above.

d) Lack of standardization in manufacturing equipment and workshop machinery badly affects the efficiency of maintenance and repairs in two main aspects: spare-parts supply and easy operation by poorly-skilled labor. It is thought, however, that for many reasons it will be difficult to find a complete solution, which will require a huge, comprehensive implementation program both at Government and managerial level. UNIDO could perhaps attempt to tackle the problem through a Special Commission for the standardization of Industrial Supplies to the Developing Countries.

e) As far as is known, the only institution dealing with maintenance and repair problems – though not exclusively – is the Management Training and Advisory Center, a Government organization located in Nairobi. This institution recently held two 2-week courses for Maintenance Supervisors. The courses run by this institution are said to be effective.

f) Apart from having set up the Center mentioned above, the Government appears to have no special policies on repairs and maintenance.

3.4 PERSONNEL

a) There seems to be a scarcity of well-trained or even adequately trained manpower on the market. Some factories do have a limited number of skilled workers who have been trained on-the-job, however their turnover is generally high because such men are in great demand. This makes on-the-job training an expensive and difficult proposition for private concerns.

It should be remarked that a certain percentage of workers presently employed has received no education at all, and only a small number appear to have attended technical schools. In any case their efficiency is seldom reported to be satisfactory.

It has not been possible to obtain any roster of personnel who have had or who are undergoing training courses. This type of information was not available.

b) As far as training facilities and vocational training centers are concerned, a general picture of the educational system is outlined in ***Appendix 42.***

Seven years of primary education is followed by technical education both for craftsmen (2 or 3 years) and technicians (4 years), which is provided by the country's five Technical Schools (output approximately 480 students per year), and three Trade Schools.

The amount of workshop practice provided in these schools is said to be insufficient to form a skilled worker, and so to remedy this situation a new National Vocational Training Center has recently been built in Nairobi; this was expected to start early in 1969. Four year courses will be offered to apprentices (expected output about 100 per year) and short courses for up-grading unskilled employed workers (expected output 400 per year) will also be held. Another Vocational Training Center, sponsored by the Governments of Kenya and Denmark is also said to be scheduled for Kisumu.

4. CONCLUSIONS AND RECOMMENDATIONS ON FUTURE POLICY

a) Maintenance and repair needs in priority order can be summarized as follows:

- Training at different levels (management, supervisory and shop-floor) in maintenance and repair, and inventory control techniques;
- improved maintenance for existing workshop facilities and provision of such machinery as may be lacking;
- implementation of a project for central worshops in the most critical districts, mainly intended to assist local workshops in improving their present physical facilities and methods of operation;
- improved availability of spare parts, which should be achieved through the implementation of the above recommendation, better clearing and transport procedures, and by new facilities as well.

b) Although the complaint was very often heard that physical facilities are lacking, it is the Mission's opinion that the really important requirement is to upgrade the existing ones without delay, particularly those in the small outside workshops.

c) The establishment of such new facilities as central workshops should prove of great benefit especially in some outlying towns, where the development of infrastructural services have not kept pace with industrial development. The main aim of central workshops should be to directly help improve the efficiency of existing workshops, so having the real though indirect effect of reducing and stabilizing prices on the industrial repair service market.

In other terms thay should have very little or nothing to do with overhauling and repairing production machinery, but should mainly specialize in upgrading the existing physical workshop facilities. Furthermore, since there would be no point in having upgraded machinery wrongly operated, some means should be found to upgrade labor in the same occasion.

To this end, the central workshops should be promoted by some local association of industry and operated on a strictly non-profit basis. Machinery repairs should be carried out in the central workshop premises and

under workshop supervision, but the manual jobs should be performed by workers from the workshop assisted. If this were feasible such central workshops would take on the complementary role of a highly specialized practical training center.

The actual feasibility of such a project should of course be studied in detail by training experts.

d) Training is a capital problem of Kenya industry. National manufacturing industries are said to be running at about 70 % capacity, and 50 % of all breakdowns are said to be caused by improper maintenance of repairs, because of the lack of skilled personnel. It is the Mission's firm conviction that the following action should be taken without delay:

- upgrading of supervisors and workers through short courses held inside the factories, and by in-plant training;
- using the existing vocational training centers to full capacity (2 shifts daily) and improving their programs to better meet present needs;
- implementing a comprehensive study to assess the need for new vocational training centers, if any, in view of the expected demand for supervisors and skilled craftsmen;

e) Spare-parts availability on the local market seems rather poor, and some action to improve this situation would certainly be advisable.

The Mission discussed this problem quite comprehensively at different levels and it appears that:

- one of the most important reasons for the shortage and high cost lies in the policy followed by national agents who try to keep their parts stock as low as possible, since heavy Customs duties have to be paid on permanent imports and the cost of carrying a comprehensive inventory is very high;
- the establishment of some kind of a Central Store might contribute to the solution of this problem. The best way of doing this would be to create a bonded duty-free spare-parts store. For strategic reasons the best location for such a store would probably be Mombasa. There is really no apparent reason why this store could not be a regional unit

serving the whole of East Africa and possibly neighboring countries too. However, in view of its complexity, this problem should be studied and discussed by the Governments concerned and by the main mother factories involved. An optimal solution could be reached by the use of operational research methods already widely applied to this kind of distribution problem. Adoption of the suggested solutions would result in a big percentage decrease in the overall inventory to be carried, while also reducing delivery delays.

Naturally, the marginal aspects of the venture should be studied in complete detail. However, even now it can be seen that the operation of such a store should be economically self-supporting, the parts being changed at an adequate storage rate. As far as the financial aspects are concerned, they would obviously be limited to the capital cost of the fixed assets, the makers simply being user of the store and retaining full ownership of the stored parts up to the time of final sale.

f) In-plant stores at the factories visited did not, in general, appear to be managed and controlled in the best way. It is the opinion of the Mission in this respect that more effective use of the available space and particularly the establishment of efficient inventory-control systems, to be tailored case by case, would certainly produce beneficial effects.

g) The volume of locally manufactured spare-parts (presently 20% – in value – of total requirements) could be raised substantially by establishing a central spare-parts manufacturing workshop. Naturally, a careful prior study would be needed to assess the spares position on a national scale, and to pinpoint the Country's present spares manufacturing capacity, both on the quantitative and qualitative side. It will then be possible to determine the size and the equipment required for a national workshop whose production would, of course, be coordinated with that of the existing shops, the ultimate aim being to produce as much of the country's spares requirements as possible in the country itself.

5. SUGGESTED PROGRAM OF IMPLEMENTATION

1. The program should provide for a comprehensive study of the following basic requirements:

   - training on maintenance and repair programs and schedules
   - training of maintenance and repair personnel
   - improvement of spare-parts inventory control methods
   - upgrading of physical facilities and operation of workshops, especially as far as outside workshops are concerned
   - providing for central workshops as outlined in point 4. *c)*
   - improving local production and availability of spares

2. While nearly all the manufacturing industries are obviously in need of a program upgrading their physical and human facilities, it is felt however that for several reasons sectoral priority should be given:

   a) to the textile industry (or to some other important and fast-moving industry such as the chemical industry) because of its impact on the national economy and the sophisticated techniques involved;

   b) to the general repair workshops, because of their acute technical shortcomings and of the "oil spot" effect spreading out to the whole of the Country's industrial development.

   As regards priority in connexion with the various repair and maintenance requirements, first priority should be given to upgrading labor and supervisory standards, and to improving existing physical facilities as well.

3. The Mission suggests that a complete program of implementation should be carried out, consisting in a short-term and a long-term phase.

   a) The short-term phase should be carried out by a team consisting of:

- an expert in maintenance scheduling procedures and in general management of workshops, with particular experience in the sector chosen for assistance;

- an expert in repair works and small-scale production with particular experience in machine tools and general technology;

- an expert in spare-parts store organization and in operational statistics;

- an expert in training systems and techniques, with special experience in repair and maintenance problems.

b) This team should be given a 12-month assignment to study and provide practical solutions and follow-up assistance according to the following program.

For the textile or other chosen manufacturing industry

A comprehensive workshop management study including:

- preventive maintenance schedule, based on sound operational statistics and recording methods;

- workshop managerial and control procedures for correct performance of maintenance and repair schedules;

- inventory control methods for spare-parts and maintenance raw materials;

- drawings, working sheets and specifications for spares;

- specifications and testing methods for raw materials;

- supervision and labor training.

For general repair workshops

- comprehensive survey of the outside assistance available in the main industrial districts, viewed in the light of present and future needs and identification of the most critical ones;

- preliminary project for a pilot central workshop to be located in a chosen district and to be operated according to the criteria set forth in point 4. *c)*;

- comprehensive assistance to an important general workshop on the basis of the program outlined for the manufacturing industry.

In addition:

- the expert in spare-parts should carry out a preliminary study concerned with the country's main needs for spares and with the practical possibility of fulfilling them both through domestic production and through implementation of the suggestion made in point 4. *c)*;

- the expert in training should carry out a comprehensive inventory of the various training centers of all types, both existing and planned, draw up a balance of the expected demand and availability of trained personnel by maintenance trades, and study a preliminary project for a complete training scheme to be implemented subsequently. This latter expert could well be supplied by or attached to the existing Management Training Advisory Center in Nairobi.

c) A detailed program for the long-term phase can only be formulated on the basis of the results and observations which will emerge during the implementation of the short phase program. However, as far as it is possible to foresee at the moment, the long-term phase should be carried out by a staff of experts and extend to a period ranging from 2 to 3 years. The program should, among other things, include the implementation of central workshops and the general training scheme.

d) Both for the short and long-term assistance, a staff of counterparts from the Companies concerned and from the Ministry of Commerce and Industry should be assigned to the UNIDO teams, so that an efficient local nucleus can be prepared for future Consulting Offices both at Ministry level and at the E.A. Association of Industries as well.

6. LIST OF APPENDICES
Surveyed firms classified by group of activity
(ISIC Code Rev. 1)

Group	*Appendix*	
201	1	KENYA MEAT COMMISSION, ATHI RIVER
202	2	K.C.C. – KENYA CO-OPERATIVE CREAMERIES LTD., NAIROBI
202	3	MARIAKANI MILK SCHEME, MOMBASA
202	4	GLAXO-ALLENBURYS, NAIROBI
203	5	KENYA CANNERIES, THIKA
205	6	UNGA LTD., NAIROBI
207	7	MIWANI SUGAR MILLS, KISUMU
213	8	CITY BREWERY, NAIROBI
214	9	COCA COLA LTD., NAIROBI
220	10	B.A.T. KENYA LTD., NAIROBI
231	11	SMALL & CO., KISUMU
231	12	KISUMU COTTON MILLS, KISUMU
231	13	NAKURU INDUSTRIES, NAKURU
233	14	E.A. BAG AND CORDAGE, RUIRU
234	15	KENYA RAYON MILLS, MOMBASA
241	16	E.A. BATA SHOE CO., LIMURU (NAIROBI)
241	17	PLASTIC AND RUBBER INDUSTRIES
243	18	LONDRA LTD., NAKURU
251	19	SOKORO PLYWOOD LTD., ELBORGON (NAKURU)
260	20	IDEAL CASEMENTS (E.A.) LTD., NAIROBI
260	21	VONO (E.A.) LTD., NAIROBI
280	22	PRINTING AND PACKAGING CORP. LTD., NAIROBI
300	23	THE VACU-LUG TRACTION TYRES, NAIROBI
311	24	E.A. OXYGEN LTD., NAIROBI
312	25	E.A. INDUSTRIES LTD., NAIROBI
319	26	PYRETHRUM PROCESSING CO., NAKURU
319	27	BURROUGHS & WELLCOME (E.A.) LTD., NAIROBI
332	28	EMCO GLASS WORKS LTD., NAIROBI
334	29	E.A. PORTLAND CEMENT LTD., ATHI RIVER
350	30	METAL BOX E.A. LTD., THIKA
350	31	KENYA GENERAL STORES, MOMBASA
350	32	INDUSTRIAL PLANT E.A. LTD., NAIROBI

Group	*Appendix*	
350	33	HARTZ & BELL LTD., NAIROBI
350	34	CONTINENTAL ENGINEERING, NAIROBI
350	35	MINOR REPAIR WORKSHOPS
370	36	MARRYATS E.A. LTD., NAIROBI
370	37	INSTRUMENTATION LTD., NAIROBI
381	38	AFRICAN MARINE ENG. LTD., MOMBASA
383	39	BURNS & BLANE LTD., NAIROBI
384	40	G. & R. (GAYLEY & ROBERTS LTD.), NAIROBI
N.C.	41	NAIROBI INDUSTRIAL ESTATE
N.C.	42	EDUCATION AND TRAINING

Appendix 1
ISIC 201

KENYA MEAT COMMISSION, ATHI RIVER

Manager: Mr. Young

1. This is the most important firm in the meat slaughtering and canning field in Kenya. It operates under close veterinary inspection and meets international export standards.

   By and large it accounts for about 20% of the sector's value added.

   Layout and equipment are generally average, but properly kept from the technical and hygienic aspects. The factory can process 700 to 900 head/day, and its laborforce approaches 1,000, out of which 130 for maintenance and repairs.

2. It has an independent workshop, with highly efficient layout and machinery of the conventional type. A maintenance schedule is effectively observed and jointly performed by workshop and production men. The shop is also responsible for maintaining the motor-vehicle fleet (about 20 units of various type). Production loss is estimated at 5%. It is to be noted that in this kind of activity the production is planned for five hours daily, the remaining 3 hours of the shift being available to allow for breakdowns and repairs.

3. An inventory to meet an average 9-month need for spare parts is carried, 6-months being the average delivery time (which includes 2 months for Customs procedures and inland transport). About 20% of spares are of a standard commercial type and not difficult to make on the local market.

4. Skilled maintenance and repair labor, is difficult to obtain, especially fitters, plumbers and electricians. There is a marked lack of training in the basic microbiological and hygienic aspect of maintenance, for which no outside training center is said to be available. Internal training schemes are operated to some extent.

CONCLUSION

The established maintenance schedule seems to be adequate for the type of operation, where the equipment is generally very sturdy, calling mainly for simple routine maintenance and cleanliness. The most exacting aspect of maintenance concerns electrical machinery and the water and steam network, for which skilled labor is a problem. The hygienic aspect is very important too, and all personnel must receive specific instruction on this.

The 9-month stock of spares seems to be very high, but it is claimed to be strictly needed especially because of the closure of the Suez Canal, and delays arising from Customs procedures and inland transport.

Appendix 2
ISIC 202

K.C.C. – KENYA COOPERATIVE CREAMERIES LTD., NAIROBI

Process Manager: Mr. Davis

This is by far the most important concern in the field, accounting for the major share of the Country's production.

The Mission was kindly received by the Process Manager but informed that it was not company policy to allow visitors around the factory. Most of the general information reported below was provided by the Accounts Manager.

1. The Company was founded in 1932 by merging three district cooperatives. It has expanded steadily since then. At the present time, the KCC processes 27,000,000 gallons of milk per year. This is supplied by about 2,000 farmers and comes in through a series of collection stations which extend as far as Eldoret. The milk is transported in rail tankers (this service is not very rapid, apparently) and in isothermic road tankers. Losses through excess acidity on arrival are reported to be around 5%.

   The production schedule in general provides for:

   – fluid pasteurized milk (66%) on one shift per day

   – powdered milk (10%) on 2 or 3 shifts per day for 10 months

   – condensed milk (5%) on 1 or 2 shifts per day for 10 months

   – cheese and butter (19%) on one shift per day.

   The Company has a payroll of about 1,000, some 8% of which are clerical grades and 7-8% maintenance workers.

2. There is an independent maintenance and repair workshop which is said to be well equipped and to follow detailed maintenance procedures. It carries out only routine maintenance and light repairs. Heavy repairs are mainly done by outside workshops some of which are stated to be fairly reliable but very costly. Because of this, the Company's policy is to purchase very high quality machinery providing capacity well in excess, and to renew a high percentage of this each year (20% in the case of transport facilities and 12-15 % in the case of production equipment).

   Apparently considerable difficulty is said to be encountered in the repair of measuring and control instruments.

3. There is a general complaint that the design of the machinery is not particularly suitable for local operating conditions. Despite the considerable excess capacity provided, a very considerable stock of spares must also be carried because of the excessively long stock reordering time involved. Local agencies are referred to as being mere "post-office" agents.

4. Little skilled personnel is said to be available. Workers are generally trained on the job by good supervisors but these are also difficult to find and train , especially from the hygienic and biological aspects.

   The hope was expressed that the position would improve when the new Kenya Polytechnic is fully operational.

CONCLUSION

According to the information received, the firm's maintenance position can be summarized as follows:

skilled labor is scarce, on-the-job training is difficult and there is a high turnover of trained men. As a consequence only routine maintenance is done internally, recourse being made to outside workshops for heavy repairs. However, these are very costly and often not very timely nor accurate, hence the firm's policy is to ensure smooth operation by ensuring excess capacity, installing new machinery and maintaining a heavy spares inventory.

This is the policy chosen by many large firms in the Country.

Appendix 3
ISIC 202

THE MARIAKANI MILK SCHEME, MOMBASA

General Manager: Mr. R.G. Cheter

Factory Manager: Mr. P. M. Nzomo

FAO Expert: Mr. A. Rasmussen

1. The project objective is to process 1,000 gph of milk collected from many small producers through a network of 500-1,000 gallon cooling centers, presently in course of completion. The milk is transported by truck, in churns. At the moment, production is 7,000 gpd, 70% of which consists of pasteurized fluid milk in throwaway packs, and 30% in the form of cheese and roll-dried powdered milk. Seasonal fluctuations in output may be as much as 50%. The plant is five years old and the machinery comes from a variety of sources. There are between 80 and 100 employees.

2. There is a small independent repair and maintenance workshop (8 employees) with a Supervisor reporting to the Factory Manager. It is equipped only for maintenance and light repairs, heavy repairs calling for outside assistance from Mombasa. The workshop equipment seems to be fairly well maintained. Idle time for maintenance breakdown is reported to be around 5%. It should be noted that excess capacity is available to meet the needs of a very marked peak-season.

   There is a reasonable scheme for routine hygienic and technical maintenance and it seems to be correctly operated.

3. The spare-parts inventory does not appear to be very well controlled, but so far there have been no serious difficulties, since the plant is relatively new and in a fair state of repair.

4. The standard of the maintenance workers seems rather low but it is well supervised. A certain number of employees are sent to the FAO Dairy

Training Center for English Speaking African Countries (Entebbe), for general vocational training.

CONCLUSION

The maintenance policy of this firm seems to be the same as that of KCC, and will perhaps resemble it even more closely in the next future, when the plant is no longer so new. All this, despite the relatively, small size of the firm and despite the fact that demand for skilled labor is, to some extent, lower in Mombasa than in Nairobi.

Appendix 4
ISIC 202

GLAXO ALLENBURYS E.A., NAIROBI

Manager: Mr. Glossop

This is a branch of the Glaxo International Co., and produces a complete line of baby-foods. Its output accounts for by far the major part of sectoral production.

It has a payroll of 15, including one maintenance specialist.

The machinery is five-years old, and it has a far smaller degree of automation than would be necessary for higher standards of quality and uniformity. Increased automation however, would entail serious operating draw-backs, due to a very low standard of training both in operators and in maintenance labor. In particular instrumentation repair is said to be a very serious problem.

Considerable excess spare stocks thus have to be carried, and the plant depreciated at a much higher rate than usual compared with plants operating in better conditions.

CONCLUSION

This is a very small though very specialized firm. It runs smoothly, relying mainly on the direct personal contribution of a very coscientious and practical manager, who does his very best to offset the lack of highly skilled labor by making recourse of his own skill and by carrying a heavy stock of spares. Notwithstanding all this, automation is kept on the low side, since it is apparently difficult to get instruments repaired.

Appendix 5
ISIC 203

KENYA CANNERIES LTD., THIKA

1. This comes under the American group Del Monte Co., and its main product is canned pineapple slices and juices. Some peas and other vegetables are also canned. It processes about 50,000 tpy, a large share of this sector's production. The equipment is middle aged and some parts are not in very good condition. There is, for instance, a bottleneck in a can sterilizing oven which cuts overall production by at least 30%. This may well be due to wrong maintenance or repair or operation.

2. There is an independent workshop with a chief-engineer, and a laborforce of 14. Operating conditions seem to be generally fair, though no maintenance schedule was to hand; repairs do not appear to be done with the required accuracy, especially as far as electrical and automation devices are concerned. Recourse is often had to outside assistance.

3. The spare parts are difficult to come by, and inventory control could be improved. Here again there were complaints about Customs and inland transport procedures, since delays here make it necessary to carry a very heavy spares and new materials inventory, mainly for special alloy steels.

4. The standard of training of the labor is average as regards both maintenance and operation (which is of no small importance). In this field, a correct understanding of sound operating procedures is, in fact, of great help in keeping the equipment performing well.

5. The Manager invited the Mission to visit the firm's sisal and pineapple farm, some ten miles away. It is a 10,000-acre estate with a fleet of 50 tractors most of them of advanced age, with a stoppage rate of as high as 40 %. Up to 400 people are employed on the sisal cropping and processing side and operations are frequently brought to a halt by a 20-year old boiler which has not been overhauled for many years. Not only is its efficiency very low, the physical safety factor is also involved.

CONCLUSION

Though no maintenance schedule has so far been prepared, maintenance itself does not appear to be too bad, despite the fact that the equipment is fairly out dated. The serious bottleneck in the sterilizing line may be due to wrong performance or operation of the steam operated temperature control system, which supports the previous statements concerning the general lack of instrumentation repair facilities in the Country.

Much worse conditions are found in the farm, where over-age machinery and the lack of maintenance minded thinking and facilities very adversely affect smooth operation and safety requirements.

As far as the latter point is concerned Government measures appear to be needed to enforce legislation on the periodic maintenance and control of boilers and pressure vessels.

Appendix 6
ISIC 205

UNGA LTD., NAIROBI

Manager: Mr. H. Cameron

1. The Company produces animal feeds, wheat, flour and maize meals, and has two large well-run mills employing several hundred workers.

2. There is a maintenance department with a staff of about 20. This has its own workshop and its own store.

   There are general maintenance schedules which are carried out with sufficient regularity. The procedure adopted is a good one, maintenance department being called into action by the Heads of the Production Departments who are responsible for the efficiency of their plants. Downtime because of breakdowns is negligible, it is reported.

3. The workshop is well equipped and managed. The machinery is in a good state of repair and is well laid out in spacious premises. The workshop also makes a good part of the required spares and does nearly all the repair jobs. Only electrical repairs are done outside.

4. The spares store is fairly well stocked and efficiently controlled. It takes an inordinate lenght of time to bring in spares from abroad. This is said to be due to excessive interference from the authorities and to red-tape hold-ups.

5. The lack of personnel training is keenly felt, especially where maintenance and repair operations are concerned, both for labor and supervision. Indeed, it is said that a constant watch must be kept on the staff since they are only capable of absorbing one concept at a time. Individual output is said to be very low. According to the Manager, as the training courses are run at present, they do not produce practical tradesmen; they should therefore be suitably modified.

CONCLUSION

This is the largest concern in the sector. Again the spares inventory is claimed to be very heavy, though very closely controlled. Customs clearance procedures again are said to add unnecessary delays to those arising from the closure of the Suez Canal.

Personnel training is again a problem. Outside courses appear to give poor results and internal training is said to be too expensive, not least because the high local demand makes it difficult to retain trained labor.

As far as workshop activity is concerned, this is a case where most of the maintenance and repair requirements are met internally. Only electrical repairs are done completely outside.

Appendix 7
ISIC 207

THE MIWANI SUGAR MILL, KISUMU

General Manager: Mr. Verma

Prod. Manager: Mr. Chattarjee

1. The firm was established in 1924, and bought by the present owners from the original Australian owners in 1947. Present capacity is about 2,000 ton cane/24 hours, which accounts for about 10 % of the national total, the main equipment having been renewed and supplemented several times. The plant is run all the year around, the needed repairs and overhauls being done according to a scheme quite uncommon for this type of operation. Though the management was reticent in this respect , it may be argued that the results are not so good; high idle time for breakdowns, low efficiency of the equipment and the very low sucrose content of the cane in at least 4 months in the year. The laborforce in the mill is about 500. The firm also has a farm of its own, which provides 60 %of its total cane requirements.

2. There is an independent repair and maintenance workshop with a responsible manager; there is a routine procedure for daily maintenance and a weekly 20-hours scheme for sectional overhauling, so that the plant can run all the year around. This scheme does not seem to ensure very effective maintenance.

   Overall production losses due to maintenance may very well be around 10 %, to which anything up to 6 % can be added for losses due to failures in cane supply. It is to be noted that breakdwon losses are partly offset by excess capacity in some critical sections.

   The workshop is divided into two main sections: for the mill and for the rolling stock (tractors, decauville-locomotives and motor-vehicles). It also has a small but fairly efficient foundry for cast-iron and metal alloys. About 30 % of all repairs is done by outdoor workshops, but the quality is not

always satisfactory. For some particular jobs (such as crankshaft regrinding and cylinder reboring, etc.) Nairobi or Mombasa workshops, or even the UGMA workshop in Uganda are used. A case was reported of a small, very poorly made shaft (10 kg, 10 hours estimated work) which cost 400 shillings from a local outside shop.

3. A heavy spares inventory is carried because such items are hard to find locally and because of the excessive reordering time. The inventory control methods are of the conventional type and could be improved.

4. The repair and maintenance manpower is too often of a very low standard, though no lower than average local standard. An internal training scheme has been outlined to meet requirements, but it seems that Government training centers would be a better solution. Indeed, after in-door training, labor very often leaves for higher wages they are given elsewhere.

CONCLUSION

This is a particular case showing how a proper maintenance schedule should be carefully studied taking into account a number of factors including not only seasonal raw material peaks but also seasonal variations in quality.

From many points of view the established schedule appears to be quite unusual, even if compared with Peru, which is one of the few countries in the world where seasonal peaks are to be observed in quantity and quality. It should also be noted that this schedule allows little possibility of carrying out heavy repairs at any time during the year.

As far as spare parts and outside facilities are concerned, the same remarks apply as made for the other firms, but the problems appear to be much more acute here because of the general operating conditions which are much worse than in Nairobi or in Mombasa. In this respect the availability of a small foundry proves to be of great help.

Again skilled labor availability seems to be much worse than in Nairobi and Mombasa.

Appendix 8
ISIC 213

CITY BREWERIES, NAIROBI

Manager: Mr. Guingley

C. Eng.: Mr. Fenton

1. The brewery is not of recent construction but it is in a good general state of repair. On average it runs at 70 % of its rated capacity but prospects look good since the market is said to grow at a fair rate (5 % per year). It employs 270 people on 3 shifts.

2. There is an independent maintenance and repair shop with a responsible chief engineer and a laborforce of 20, 30 % of which is skilled. A maintenance schedule is said to be under study. The workshop equipment is fairly complete, only electrical and instrumentation repair jobs being contracted to outside workshops. Repairs for the motor-vehicle fleet (40 units) are also contracted out.

3. The spare-parts store carries a 20,000 KL inventory: about one year's consumption. None of the spares is locally produced. Special steel alloys are difficult to obtain and not very reliable.

4. The training of maintenance workmen is a particularly crucial problem, both from the technical and hygienic point of view. A particular lack of training in the microbiological aspects of the operation was commented upon and as yet there is no possibility of local outside training being done.

CONCLUSION

This firm accounts for about 20 % of the domestic production of beer. Maintenance appears to be adequate, though no schedule has been established,

as yet. Again electrical and instrumentation repairs are sent out, whereas mechanical repair requirements are met by a fairly complete and well managed workshop. The same problems as in other places are posed by labor training and spare-parts inventory which is said to be not less than for one year's consumption.

Appendix 9
ISIC 214

COCA COLA LTD., NAIROBI

Manager: Mr. Cork

1. This factory was installed some years ago, and has the standard features commonly found elsewhere in other branches of this company. The laborforce is about 150-2 shifts.

2. There is no independent workshop, 3 men being given the task of routine maintenance and emergency repairs. Heavier repairs and overhauls are contracted out to a small artisan-type workshop, whose cooperation is fully appreciated.

3. There is a good control of spare-parts, with an inventory valued at E.A. Shs 140,000 and an equal yearly consumption for the equipment. The yearly consumption of motor-vehicle spares is about E.A. Shs 100,000.

4. The personnel is averagely skilled and well managed. Labor turnover is kept low by a liberal approach and a good human relations policy.

CONCLUSION

This is a typical example of advanced methods for satisfactory and cheap outside maintenance services. However, it should perhaps be noted that the main reason this method proves so effective is because:

- the type of operation calls for very proper and clean premises;
- the small number of workers minimizes the problem of training;
- the equipment is well and safely designed having been tested and improved through a number of plants throughout the world;
- last but not least, the manager had the good fortune to have chosen a

very experienced and dynamic personnel to set up and run a small but efficient workshop.

It should be noted that the repair needs of the firm are by no means very diversified and are made much easier by a heavy spares inventory (one year's consumption).

Appendix 10
ISIC 220

B.A.T. KENYA, LTD., NAIROBI

Plant Engineer: Mr. V. Kamau

1. This is a huge concern which makes all the national brands of cigarettes and tobaccos. Company policy did not permit the Mission to visit any more than the maintenance and repair workshop. However, the general impression gained was a good one, and the establishment seems to be soundly operated.

2. The maintenance department has 24 workmen headed by an engineer. Maintenance is carried out according to a carefully thought out preventive maintenance scheme which will shortly include predetermined timing. The system includes procedures for gathering useful statistical records and for processing them in a timely manner for managerial control. Down-time is reported to be negligible. The workshop is well equipped and its layout is functional. The machinery is efficient and well cared for. 85 % of the repair jobs are done here and only major jobs are contracted out. The Manager made the following comments on the outside shops: apart from a few which are good, the remainder are reluctant to work to drawings and prefer to copy from models; they lack adequate machinery and their workmanship lacks precision.

3. There is a well organized and well-stocked materials store. It is stated that it is difficult to obtain special steels to specification. Furthermore, the inordinate length of time required for imports to come through means that costly air-freight has to be resorted to on occasions.

4. The general policy with regard to Maintenance Department staff is that of keen selection supported by a very liberal payroll. At the moment, about half the workers come from the Kabete Vocational School and they have given good results. The other half were selected from the most promising workers in the factory and trained internally. It is

thought that the general vocational training policy could be improved by better differentiating the courses for the various trades and more especially by concentrating to the utmost on the practical side while imparting only a limited amount of theory. Foreman grades might well be selected from the best trainees and then follow supplementary courses.

CONCLUSION

The maintenance scheme and performance are apparently very good. This is obtained through a well-equipped, well-run workshop, good management, large spares inventory and careful selection of manpower. The price paid for this consists mainly in high machinery depreciation, high salaries and availability of spares, even if these have to be air-freighted; high prices paid for outside assistance.

This policy could very well prove to be the soundest in every kind of activity. It should be noted, however, that it requires management which is very economically minded, open to new ideas, and entails a product which generates high sales and good profits.

Appendix 11
ISIC 231

SMALL & CO., KISUMU

General Manager: Mr. Tijani

The Company operates 4 medium-sized ginneries and one oilmill in Malikisi. It was not possible for the Mission to arrange an on-site visit, but a meeting was arranged with Mr. Tijani at his Kisumu office. The following data were collected:

1. The Lake Victoria cotton-growing area produces about 2/3 of the total national production, namely 13,000 bales of 1,300 lbs each.

2. There are at present 6 ginneries in the area operating about 60 days p. year, at a capacity 40-50 bales p. day. The average cropping distance is 30 to 35 miles, but the roads are mainly of the dry-weather type, and the operation is frequently disturbed by floods and interruptions, and this is the most serious problem.

3. The local lint production is expected to be completely absorbed by the increasing textile activity of Kisumu.

4. The equipment of the ginneries operating in the area is fairly standardized in type: the spare parts are supplied by Kampala agents, and no particular problem arises in this respect.

5. Maintenance labor is mainly of the average national standard; however, efficiency is ensured by well trained foremen.

CONCLUSION

As far as could be learned, the operation may well have no special maintenance

schedules and/or usages, but the problem is solved by standardization of equipment, easy availability of spares and experienced foremen. It should, however, be remembered that the firm is located at a traditional and strategic point for this kind of operation, furthermore, cotton ginning equipment is generally very sturdy and by no means sophisticated.

Appendix 12
ISIC 231

KISUMU COTTON MILLS, LTD., KISUMU

1. This is a completely new factory, very well designed, equipped and managed. The equipment is of different makes, properly chosen. The cost is estimated to be 1.3 million KL. Planned final production will be 20 million yards cotton fabrics, present production being about 9 million yards of gray cotton fabrics, roughly 20 % of the Country's production. A licence for wash-and-wear cotton fabrics is said to be underway. Present manpower is about 700, of which 40 for maintenance.

2. There is an independent workshop with responsible manager. This has a rational layout and good equipment. A preventive maintenance scheme is being prepared. It is estimated that in view of the inefficiency and expensive nature of outside workshops the internal repair facilities will have paid for themselves in 3 years. The local workshops of the EA Railways are said to have great excess capacity, but that this is however not readily available for non-railway use. The management realizes that the factory's maintenance and repair needs will be an acute problem in the near future, when the operation will be running at full capacity and the condition of the equipment will start to drop off. In view of these considerations machinery of proven reliability and involving an average degree of automation was chosen.

3. The spare-parts inventory presently carried covers 4-month needs (26,000 KL), but this is expected to gradually increase. As far as possible spares are imported from Kampala agents. It was claimed that the Mombasa Custom House procedures could be improved to the benefit of all concerned and the same was said about the new inland transport organization. However, as far as local production of spare-parts is concerned, their present cost is said to be at least 50 % higher than the imported ones, and their quality far lower.

4. Skilled manpower is hard to obtain, and so much more skilled supervision. An in-plant training scheme is provided, capacity 20 to men.However internally trained labor has generally proved have a high turnover because of the great local demand.

CONCLUSION

The following conclusions can be drawn:

- sound management is fully aware of the importance of the need for physical and human facilities to ensure proper maintenance and repair;

- in a region such as this which is still in the first stage of development, there is little outside assistance, and what there is is not very reliable and highly expensive.

Again it is claimed that the Customs procedures at Mombasa and the new Inland Transport Organization should be improved.

Appendix 13
ISIC 231

NAKURU INDUSTRIES LTD., NAKURU

Owner: Mr. Shaah

1. This is an old factory producing low-quality blankets and holding a large share in the national production of this commodity. Both the buildings and the equipment are old-fashioned and badly maintained, the only exceptions being two fairly efficient spinning frames.

   There are in all 8 spinning frames each with 80 spindles and 110 looms operating at 65 strokes per minute.

   The actual overall cost of the plant is no higher than 300,000 K£. The firm employs 420 workers on two shifts per day. Loss of production through breakdowns and poor training is estimated to amount to some 25%, though a large excess capacity is available and the machinery is designed to operate at low speed.

2. There is an independent maintenance and repair workshop, provided with as much old repair equipment as is strictly needed for emergency repairs, which is the only type of maintenance and repair procedure understood and performed. A fairly high percentage of the looms are in fact cannibalized for spares and so stand idle for a long time. Four workers including the foreman, look after maintenance. Their ingenuity in coping with all the various emergency needs is truly remarkable.

3. The Mission was not allowed to visit the spare-parts store, which anyway is thought to be no more than a scrap-parts store.

4. The maintenance crew seems to have the peculiar kind of training needed for this type of operation.

CONLUSION

This is a typical case of a management operating a very obsolete plant on a day-by-day basis, with an exclusive view to immediate profit. Every technical and managerial rule is ignored. Of course this is possible only when depreciation charges are not to be taken into account, and when gradual shut-down of the operation is the firm's policy.

Appendix 14
ISIC 233

EAST AFRICAN BAG & CORDAGES, LTD., RUIRU

Chief Engineer: Mr. W. Read

1. This is an old-established firm, employing about 2,000 people. The main item produced is sisal bags, mostly of the circular type, for which the firm is specially equipped. The equipment is middle aged, and seeems to be properly looked after. Though no data were available concerning the output, it can be stated that this firm holds a major share of the total national production.

2. There is an independent workshop, with a laborforce of around 150. It is generally well equipped, and has some very valuable special purpose machinery. A maintenance schedule is available and appears to be properly performed. Production loss due to maintenance breakdowns is estimated at 6 %, some excess capacity in crucial machinery helping achieve this low figure.

3. The spare-parts stock is under good control. Its value is about 10% of the total capital investment. Sufficient stock is kept to cover 12-months needs for imported spares, and 3-months needs for locally made ones. It was felt that Customs clearance and inland transport procedures could be speeded up.

4. Skilled labor is difficult to obtain and skilled supervisory staff even more so. No internal training scheme is provided, but every effort is made to ensure good control of manpower.

CONCLUSION

This is a case of huge concern designed to operate with little or no outside support for ancillary services. Complete equipment, spares and skilled manpower is provided so that no external help is needed. As will be appreciated, a 12-month spares inventory is a very large one.

This situation gives additional weight to the assertion that outside workshops are costly and not very reliable.

Appendix 15
ISIC 234

KENYA RAYON MILLS, MOMBASA

Prod. Manager: Mr. Y. Kak

1. This is an old-established factory, producing about 250,000 lbs/month of rayon yarn, with 3-shift operation. From what the Mission was told, this is the only concern operating in the field.

   About 66% of the yarn is sold, and the balance used for the production of 125,000 yards of fabrics monthly. There are 90 looms, all of them over-age; their overall efficiency is said to be 85%. This result is achieved by assigning one man to every two looms, though these are of the low-production type. The overall laborforce is about 400.

2. The Mission was allowed to have only a very quick look into the factory. Its main impressions are summarized below:

   a) the layout and the machinery is outmoded, its actual value being perhaps not higher than 150,000 K £;

   b) the maintenance workshop has the same features as the factory as a whole; 10 laborers are employed on routine maintenance and light repairs. Their skill is rated as better-than-average. There is no maintenance schedule, as such. The equipment is however given the necessary maintenance to enable it to be operated at a fair standard. Outside assistance is called upon for heavy yearly repairs. The cost of this is said to be fairly high;

   c) some degree of control is excercised over the spare-parts store which has about 12,000 pounds worth of stock. Mothly consumption of spares amounts to some K £2,000. The supply position for new spares

is however very difficult, since few of them are available on the market; hence most have to be custom made. Improving the local possibilities for producing such spares could be very profitable; their present cost is very high;

d) skilled maintenance personnel is again difficult to find and the turnover is very high.

CONCLUSION

It would be useful to assess by the Work Sampling Method the real efficiency rate and the percentage allocation of total loss due to individual breakdowns. This should be of great help for sound maintenance schedule and spares control, thus reducing the need for such expensive and hard-to-come-by items such as skilled labor, spares and outside assistance.

Appenidx 16
ISIC 241

BATA SHOE COMPANY, LIMURU (NAIROBI)

General Manager: Mr. Strom

1. This factory belongs to the Canadian Bata group and was set up some 10 years ago to satisfy the market requirements of East Africa. Its contribution to the sectoral domestic output roughly approaches 40% .

   The factory produces rubber and leather soled, leather and fabric tapped shoes for men, women, and children. It is complete with its own tannery. At the time of the visit the factory was operating at 70 %capacity. It employs 1,400 workers, 80% on a single day shift. The machinery is of various origins and is between 5 and 10 years old.

2. There is a properly laid out maintenance and repair workshop, with responsible manager. The machinery is in a reasonable state of repair. The shop only does light repairs and routine maintenance, the remaining jobs (some 25%) are done by outside shops which can provide satisfactory though costly assistance. However, the quality of castings is not very good. It is difficult, so it appears, to find good quality special steels on the market. There are also particular difficulties where instrumentation is concerned.

3. There are no maintenance schedules as such. Repairs and maintenance are done when the machinery is shut down because the production schedules have been fulfilled. In the shop, work is done along practical lines and is related to the average standard of the workers, who often cannot read drawings. Idle-time due to breakdowns is said to be around 2-3% . It should however be noted that the machinery is run well under capacity. Lost time due to breakdown of the outside power supply system is also estimated at 2% .

4. Bringing in spares is a very costly business (closure of Suez; delays and hinderances in clearing Customs and in overland transport).

Conventional inventory control methods are used. However, it would appear that in view of the size of the enterprise, better organization could well reduce the stocks. It is reported that annual consumption of spares amounts to 10% of the value of the machinery. Machinery renewals too are said to run about 10% per annum, mainly because of continuous model changes.

5. The standard of the maintenance personnel (some 100 workers) does not seem to be very high. There is an internal training center for different trades with 3-year full-time courses taking 50-60 trainees. Request outstrip the number of places.

CONCLUSION

Here some special features of the operation have to be kept in mind if a proper type of maintenance schedule is to be selected, and the real significance of the figures quoted for spares and efficiency are to be correctly understood.

As above clearly mentioned the factory is running at 70 % capacity and the production schedule calls for alternative use of a number of machines according to many different types of products. Furthermore machinery is continuously renewed as required by frequent model changes.

As a consequence :

- the figures quoted for efficiency are to be referred to idle man-hours;
- the machinery generally needs only routine maintenance and light repairs ;
- the maintenance schedule must be very flexible and in accordance with the production schedules ;
- since there is little need for heavy repairs, the firm's policy is towards out-door workshops;
- since out-door assistance is costly and repairs are needed mostly for special and sophisticated parts or jigs, preference is accorded to new spares rather than to spares reclamation.

The total spares and depreciation charges amount to anything like 20%, which is indeed very high by common standards.

There are obviously reasons to think that this policy has been found to be an optimal one, due account taken of all the operating conditions and of the trade's requirements as well.

More detailed figures or indicators concerning the spares inventory were not available.

Appendix 17
ISIC 241

PLASTIC AND RUBBER INDUSTRIES, NAIROBI

Owner: Mr. Rahim Kassam

1. This is a typical directly-owned and managed concern, created during the last 3 years as a consequence of the expanding local market for plastics and rubber commodities. Its main output consists of soling sheets and sand-shoes, which are sold at a very competitive price. A project is said to be under study for injection-moulded plastic items. The laborforce is about 40. The layout is the result of day-to-day needs for expansion and new machinery. The machinery is of Japanese make, and seems to be efficiently kept and operated.

2. There is no independent workshop. Two maintenance men meet the day-to-day needs according to some kind of maintenance schedule. All repairs are contracted to a small outside workshop for a fixed monthly price of Shs. 3,000. This seems to be a noteworthy example.

3. The spare-parts inventory is said to be very small, mainly due to the very efficient services provided by the Japanese makers (see *Appendices 18, 31*).

4. Internal maintenance labor is averagely skilled and properly controlled by the owner.

CONCLUSION

This seems to be a very practical and plain solution to the problems of maintenance. Of course, this appears to be possible only in small concerns, very practically managed, and for equipment which is not so much diversified and not requiring frequent heavy or emergency repairs.

Appendix 18
ISIC 243

LONDRA LTD. NAKURU

Owner: Mr. Shaah

1. This is a medium-sized factory which was established several years ago as a family-type operation and since then has continuously expanded up to its present capacity (a laborforce of 70). The firm produces ladies underwear and clothes of an average quality standard. Though no significant figures were available, it is thought that its contribution to the sectoral domestic output may approach 10%. The machinery is mainly 4 to 5-year old, and mostly of Japanese make.

2. There is no independent workshop. Routine maintenance and small repairs are performed by 2 skilled men under the owner's direct supervision. More sophisticated breakdowns are contracted out or often the difficulty is obviated by using new spare-parts, which in general are readily available.

3. The yearly consumption of spares is around E.A. Shs. 20,000 (10% of the equipment cost), while the value of the inventory does not exceed E.A. Shs. 10,000. This small inventory figure is mainly due to the very efficient service provided by the Japanese makers, which was recently improved by an effective intervention of the Japanese Export Trade Office. The same cannot be said of other foreign makers, whose local agents are apparently not so diligent. However, it is claimed that delays of up to two months are presently experienced in clearing and forwarding.

4. The maintenance personnel is sufficiently skilled and well managed under the owner's direct responsibility.

CONCLUSION

The type and size of operation, the operating conditions and the design of the

equipment used call for little maintenance and lesser heavy repairs. Moreover, repairs are not seldom carried out by plain substitution with new spares. Under this aspect the makers' policy to improve the client's service appears to be very effective, the small bulk of parts helping the implementation of such policy.

Appendix 19
ISIC 251

THE SOKORO PLYWOOD LTD., ELBORGON, NAKURU

Manager: Mr. Knight

1. This plant belongs to the important TIMSALES group, with the DFCK (Dev. Fin. Cor. Kenya) as a sizeable share-holder. The machinery is German. It was bought secondhand and installed in 1967. Its rated capacity is 7 million square feet per annum which is said to be just about the present capacity of the Kenya market too. The firm has around 100 employees. The general layout gives the impression of being rather crowded and this has a marked effect on manpower productivity.

2. There is a small independent maintenance workshop employing 6 workers, but no responsible manager. About 75% of repair needs are satisfied by outside workshops in Nakuru. There is a general maintenance schedule and this appears to be correctly operated. Instrumentation equipment is mostly repaired in Germany. Idletime due to breakdowns is roughly estimated to be no greater than 2%. This figure may appear too optimistic. It is however to be considered that the equipment is newish, and that the smooth flow of the production entirely relies on very little sturdy machinery and steady equipment. Furthermore, the overall plant efficiency will be affected by factors other than mechanical breakdowns, such as raw material supply.

3. One year's stock of spares is carried and there is also a replacement for each part of the automatic control equipment, as well as for some special components. The value of the spares carried amounts to about 15% of the overall investment cost. Reordering time is said to be about 9 months, 3 months of which is for Customs procedures and for transport from Mombasa.

4. The standard of the maintenance team is about on a par with the national average, but it is well supervised by the Plant Manager and his assistant.

CONCLUSION

Maintenance and repair problems seem to pose no particular problem at present, because of the very good conditions and the sturdy nature of the equipment involved in the operation. Furthermore, the management is apparently very sound and in condition to closely supervise the labor. The only problem appears to be the supply of some special parts, such as shearing blades, fans and automatic instrumentation, for which a safe 9-month stock is shown to be necessary. It is likely however, that in future years the problems could become more serious.

Appendix 20
ISIC 260

IDEAL CASEMENTS E.A. LTD., NAIROBI

1. The Company was founded in 1953 with a nominal capital of 50,000 pounds. It produces agricultural implements, steel and aluminium window frames and other steel products. It has a Staff of 20 and a laborforce of about 200. Two or three shifts are worked in some departments. The capital investment is valued at about KL 60,000. The factory appears to be well managed and rationally laid out. There is sufficient machinery and it is in very good condition. No breakdowns are reported to occur which affect to any remarkable extent the production schedule.

2. There is a 10-man maintenance department with responsible engineer. This sees to the maintenance operations laid down in a general schedule. It also does nearly all the repairs, for which much of the production departments' facilities is used. Labor idletime is said to be negligible. Assistance provided by outside repair shops is stated to be not always satisfactory and often requires strict supervision.

3. The spare-parts stock is under good control, but it is necessary to carry a large inventory (about KL 20,000 i.e. 33% of capital investments), since the re-ordering time is excessive, and mainly delayed by the present clearing procedures and organization of inland transports.

4. The workers in the maintenance department have no specific training and their efficiency is very low. If the operation to be performed is new and anything but simple, it must be carried out in a number of steps. Most of the workers are recruited off the street, but even the training of those few who have followed courses is said to be unsatisfactory.

CONCLUSION

The very nature of this operation and of the equipment involved favorably affect the efficient maintenance of the workshop. The excess capacity and interchangeability

of some machinery causes the labor idletime to be small. However, it may very well be that recording procedures are not so good in this respect and that their data are not so reliable. This assumption is supported by the fact that often the production operators carry out by themselves maintenance and small repairs. The spare-parts inventory is apparently very heavy, indeed; this may be to a great extent responsible for the smooth running of the operation. A better tool-room service could be perhaps the most important factor for improved efficiency. Skilled labor is again a problem.

Appendix 21
ISIC 260

VONO E.A. LTD., NAIROBI

Manager: Mr. Wolff

1. This Company was set up recently with a capital of 25,000 pounds sterling, half the amount being subscribed by Unilever. It took over a factory built in 1952 but which was badly run-down. The firm makes metal beds, bedsprings, spring matresses, and steel office furniture. It employs about 200. No figures are available concerning output, but it is perhaps the only factory in the country producing such items.

   The machines (value Lsg 50,000) are badly laid out and most of them are inefficient because of lack of maintenance for many years under the previous management. Production losses due to breakdowns appear to be around 10 %, excess capacity in some crucial sections being a great help in this respect. A huge reorganization program is under way: it is hoped that it will be implemented without delay so as to resolve the firm's most pressing problems.

2. There is an 8-man maintenance department. These operatives appear to have moderate capabilities. The department is mainly engaged on repairing breakdowns. Downtime is said to be around 10 % : 7.5% for repairing brewkdowns and 2.5 % for other causes. A preventive maintenance plan is said to be under study. A large amount of work is done by outside repair-shops: this accounts for 10 % of the factory's costs (excluding labor costs). However, it is planned to do as much work as possible internally in the future. The present capacity of the maintenance department should therefore be conveniently increased, mainly by adding som general purpose tool machinery and heat treatment facilities and by improving the efficiency of the existing physical and human facilities.

3. The spare-parts stock is presently being reorganized. Lsg 7,000 of spares are carried which appears to be very large indeed in comparison with the

investment in fixed assets. The firm's future policy is said to be mostly oriented towards air-freight, which for most parts is thought to be less costly than carrying a large spares inventory. It is to be noted that 50 % of breakdowns are said to be due to lack of spares.

4. The personnel is untrained and does not appear to be very diligent, its efficiency being rated at around 60 %. The training of those workers who have followed courses is stated to be very general, no practical work being involved in the training program.

CONCLUSION

The firm is apparently passing through a very crucial stage, whose outcome should mainly depend upon sounder management.

Judging from the figures quoted, the present efficiency of the maintenance and repair services may well have contributed to some extent to this situation. Careful reorganization of this service should therefore be included in the program. The main aim should be to:

- establish sound maintenance and repair schedules for the existing facilities, while providing for some new ones as mentioned above, so that the cost of outside assistance and expenditure on spares could be substantially reduced;

- improve the average skill of the laborforce mainly through closer supervision and better procedures, if more highly skilled manpower is not readily available.

Appendix 22
ISIC 280

PRINTING AND PACKAGING CORP., LTD., NAIROBI

Production Manager: Mr. G. A. Stockdale

1. The Company was founded in Mombasa in 1900 and later moved to Nairobi. The general organization appears good. The machinery is of recent construction and extremely well maintained. Its value is fairly high. The layout is good and there is plenty of space. The establishment operates to capacity throughout the year on a three-shift per day basis, producing card-board boxes and containers, stationery and packaging commodities. It has an office staff of 30 and a work staff of 340. It makes a most important contribution to the country's sectoral output.

2. There is a maintenance department which employs 8 people. There is a general maintenance plan, but this is not very rigid. Maintenance is mainly done at the request of the Heads of the Production Departments, which collaborate very efficiently through proper operation and close checks of the machinery operated. Downtime for repairs is said not to exceed 3% of the total number of hours worked by the machinery.

3. The workshop is sufficiently well equipped. The machinery is in good condition and is fairly well laid out, although not as well as in the production departments. Nearly all repairs are done internally because outside shops seldom do a good job and often they are too expensive.

4. Spare parts are under effective control and this allows the overall stock value to be kept as low as KL 4,000.

   It is reported that about 50 % of the required maintenance materials can be obtained on the local market though turnover is very high. There are many complaints about the lenght of time it takes to bring in spares from abroad.

5. Skilled personnel for maintenance and repair is very scarce. There are, however, two old experienced supervisors who succeed in keeping the

production equipment in good order and in ensuring smooth operation. Their contribution to on-the-job labor training is very much appreciated too, but the turnover of upgraded personnel is very high. The smooth operation of the firm also relies largely on the skill and close supervision of the production manpower.

CONCLUSION

This is a very good example of how close collaboration between production and maintenance departments can give excellent overall results.

Appendix 23
ISIC 300

THE VACU-LUG TRACTION TYRES, NAIROBI

Manager: Mr. Valjec

1. This is an old-established firm, with branches in Uganda and Tanzania. It retreads and remoulds any type and size of tyres. The rebuilt tyres are said to have an average life of 75% as compared with the new ones, but they cost 60% less. On average, the machinery is 5 years old. The layout and premises are being renewed. It is the most important firm in the sector. The laborforce amounts to about 70, out of which 8 for maintenance and repair.

2. There is no independent maintenance workshop, and some machine tools and working accommodation are installed wherever possible, quite often in the open air.

3. There are no special maintenance or spare-parts problems, except for moulds which are completely imported. Fairly frequently some of them are brought in by air-freight. More care in inventory control and better accommodation could considerably improve the situation.

4. Training of maintenance labor is again a problem, but many difficulties are obviated by a liberal wage policy and fair human relations.

5. The management was offered some suggestions regarding the possibility of producing rubber gaskets, couplings, belts and so on. Such suggestions will perhaps be taken into consideration in the near future, when some of the present problems have been eliminated.

CONCLUSION

This is a small but challenging firm which is very likely to expand further when the

present Africanization problems are solved.

Then the present maintenance and repair problems, which are mainly concerned with moulds, will have a major impact on this firm's operation, and will need closer control.

Appendix 24
ISIC 311

E.A. OXYGEN LTD. NAIROBI

Manager: Mr. P. C. Jolley

1. This Company is a subsidiary of British Oxygen. It has a payroll of 30 and produces industrial and medical gases and products for oxy-acetylene welding. The factory is well organized, and rationally laid out. The installations are in a good state of repair. The output of this firm makes a major contribution to sectoral production.

2. There is no independent maintenance department. Maintenance and repairs are done by the production departments, according to a schedule which seems to be well performed. Assistance from outside workshops is said to be fairly satisfactory, but expensive. Downtime is reported to be negligible.

3. Spare-parts are supplied by the mother company and seem to be under good control. The inventory value does not seem excessive as compared with the capital value of the installations; however, it could be cut if supply time could be shortened. Apart from the increased sailing time due to the closure of the Suez Canal, there are serious complaints about the excessive clearing time at Mombasa and the present inland transport organization. In some instances, items have to be air-freighted to Kenya which is very costly. Local availability of common materials for maintenance and repairs is said to be fairly good, except for special steels and alloys.

4. Available personnel is lacking in training and has to be upgraded on the job. Provided that the job is of a repetitive nature, their performance is satisfactory, but anything out of the ordinary routine has to be strictly supervised. There were, however, complaints about low standard of labor which has been through vocational training courses.

CONCLUSION

Good maintenance schedules, effective inventory control for spares and close supervision of labor ensure smooth operation of this firm.

Appendix 25
ISIC 312

EAST AFRICAN INDUSTRIES, LTD., NAIROBI

Managing Director: Mr. Berry

Maintenance Manager: Mr. Keith

1. This company belongs to the Unilever group. It produces toilet and washing soaps, toothpaste, vegetable oils and fats, and synthetic detergents. The firm has 500 employees, 70 of whom are engaged on maintenance. Its contribution to sectoral output is very large.

2. There is an internal repair and maintenance workshop with a responsible manager. The layout is rational and the machinery is in reasonably good order. It occupies 70-80 employees, at least ten of whom are skilled hands. The workshop only does light repairs, the remainder being done by outside shops (Harts & Bell; Marryats, etc.) which are however not so readily available and costly.

3. Maintenance schedules exist and appear to be carried out fairly correctly, especially in the case of equipment and machinery subject to corrosion. The quality of the jobs done in the workshop is satisfactory but it is difficult to assess its productivity. The introduction of a bonus scheme is being considered. Production losses due to breakdown are said to amount to around 8%, of which 1% for power failures.

4. Some £ 36,000 is bound up in spares, and annual consumption is said to amount to £ 20,000 approximately, the average turnover thus being about 8 months. Inventory control is of the conventional type. The possibility of calling for ready outside assistance shows to be an easy though expensive way to solve the problems which might arise from out-control spares.

5. The standard of the maintenance personnel may be considered as average, but efficient control appears to be strictly needed at the middle management

level. However, there is a relatively high percentage turnover of skilled labor.

The Management declared itself to be very interested in the creation of outside effective training centers and in the setting up of a non-profit association for maintenance and repairs.

CONCLUSION

Maintenance procedures appear to be properly scheduled and performed. The figures quoted for production loss are not unsatisfactory, but it is felt that they could be further reduced, taking into consideration that production lines of the continuous type are generally designed for an excess capacity in some critical sections so as to ensure smooth operation of the whole line. The main problems seem to be spare-parts and skilled labor. The former is claimed to be aggravated by Customs and inland transport delays; the latter by difficulty in landing supervisors. Nor is outside assistance completely satisfactory and readily available at a reasonable cost.

Since skilled labor is so scarce on the market and the average product of the Government Training Centers does not appear to be particularly high standard, the firm should be interested in having upgrading courses of its own; but upgraded labor has a tendency to leave very soon.

A fair solution to the problem is thought to be that of setting up a training center supported by a non-profit association reporting to the Chamber of Commerce , and Industry.

Appendix 26
ISIC 319

THE PYRETHRUM PROCESSING COMPANY OF KENYA, NAKURU

Maintenance Manager: Mr. Scaglioso

1. The original plant was built in 1936 for packing dehydrated pyrethrum flowers. A 10-tpd extraction plant was added in 1958 and this was further increased with a 24 tpd plant in 1960. The present plant has enough capacity to process the whole of the national production (which accounts for 70% of world production). Despite competition from synthetic products, market prospects still look good, since to date pyrethrum extract is the only insecticide to which insects do not become accustomed with time, and which is not harmful to warm blooded animals. Operating and maintenance conditions seem to be very good and there is a modern, well-looked after fire-fighting system The plant provides employment for 300 workers on three shifts per day.

2. There is an independent repair and maintenance department with its own manager It is fairly completely equipped to cope with routine maintenance and overhaul needs, and has about 75 workmen whose standard is high compared with the national average. Carefully thought-out maintenance and overhaul schedules are in existence and are correctly performed and checked.

3. About one year's spares are carried. These are valued at about 60,000 pounds, i.e. 20% of the capital value of the machinery approximately. Only 15% are fabricated in the country.

   Despite heavy Customs duties and transport costs (over 120%) for imported spares the quality of nationally made parts is low and the cost is high. Castings are particularly expensive and said to be of not very good quality, while great difficulty is encountered in finding special steels of known and guaranteed quality on the local market. In support of this assertion the case was quoted of a steam distribution system which had to be replaced a few months after it had been completely renewed. Laboratory tests also

appear to be costly and time-wasting; it seems that the only facilities available are those at the Railway Workshops in Nairobi.

The need for a standardization study is keenly felt; to this end a UNIDO Commission for the study of stardardization of plant for the developing countries could well be useful.

4. The training of maintenance staff is a serious problem, it appears. Every effort is made to overcome the difficulties by in-plant and on-the-job training schemes; however, the labor turnover is very high because of the sustained demand for skilled manpower on the market.

CONCLUSION

The efficiency of the firm's maintenance and repair services are mainly ensured by a very keen and responsible manager, who carefully looks after every aspect of the problem, especially as far as spares and trained labor are concerned. He succeeds in coping with so many difficulties through very close personnel supervision. Outside assistance, even from Nairobi or Mombasa, does not appear to be very reliable, skilled labor is very scarce, and experienced supervision even more so. A heavy spares inventory has to be carried. This could largely be reduced through spreeding-up Custom's procedures and inland transportation

Appendix 27
ISIC 319

BURROUGHS WELLCOME E.A., LTD., NAIROBI

This is an important Company belonging to the Wellcome group which manufactures medicinal preparations and veterinary medicines. The Mission was not allowed to visit the establishment nor to collect information.

The General Manager informed, however, that since the machinery is highly specialized only skilled European operators are used, a large stock of spares is needed and all repairs are to be done internally by well-trained personnel. Outside workshops are never used.

Appendix 28
ISIC 332

EMCO GLASSWORKS, LTD., NAIROBI

Plant Manager: Mr. G. Bormioli

1. The Company forms part of the Madhvani group which bought the factory in 1959. The general organization of the factory is very good. The machinery is partly new and is valued at Lsg 180,000. It is very well looked after and rationally laid out. The factory produces mainly glass bottles, jars and lamp globes. It operates at 80% capacity and produces 27 tpd. There is a Staff of 20 and a Workforce of 180.

2. The factory has a 9-man maintenance department with its own workshop and its own store. There is a preventive maintenance plan which appears to be very well performed especially as far as production facilities are concerned. The general results seem to be very good. Down-time is reported to be negligible, general overhauls being carried out very carefully every two years.

3. The maintenance workshops is well laid out and well equipped with machinery and equipment kept in a very good state of repair. Almost all repairs are done internally, external assistance being considered to be not very reliable and very expensive.

4. There is a rather small spares store (value carried: Lsg3,000) because the bulk of the spares required for the general two-year overhaul is brought-in when required. No idletime through lack of spares is reported. There are complaints about the time it takes to bring-in spares from abroad and especially about the delays between the time the boat docks in Mombasa and the time the goods arrive in Nairobi.

5. Another complaint concerns the very low level of training of the workers and their equally low output. It is stated that they cannot be relied upon and must be continuously supervised. There is a shortage of skilled labor and supervision on the market, and it is said that even those workers who have

been through training courses lack sufficient practical workshop know-how. It is hoped to set up an internal training course shortly, but there seems to be little faith that it will be successful.

CONCLUSION

According to the quoted results and to first-hand information, the maintenance service appears to be well scheduled and performed. General overhauls which are of paramount importance in this kind of activity are carefully prepared and carried out, and routine maintenance is apparently very effective.

Negligible overall breakdowns do not mean of course all year round continuous operation of the individual sections, but intelligent use of the excess capacity provided for in the case of critical sections or machinery.

The results appear to be all the more interesting inasmuch as they are attained despite the acute shortage of skilled man-power and supervision both in the production and in the maintenance sections.

The key of the problem is obviously to be found in sound management, proper maintenance and repair schedule, and close supervision of labor.

This conclusion is also applicable to a number of other large, well-managed concerns surveyed by the Mission.

Appendix 29
ISIC 334

E.A. PORTLAND CEMENT, LTD., ATHI RIVER

Managing Director: Mr. Dixon

Prod. Manager: Mr. Dittle

1. The factory was set up in 1955. It accounts for about 50 % of the whole national production (about 300,000 tons). Interterritorial exports which had a favorable trend up to some years ago, will be severely affected by the new cement works in Tanzania. On the other hand, domestic consumption should at least partially offset the expected decrease in exports. The laborforce approaches 400.

2. There is an independent workshop with a responsible manager. There are routine maintenance and overhauling schedules which seem to be correctly operated especially in the crucial sections of the works. As far as its capacity is concerned, the workshop is supposed to be mainly selfsupporting, except for rewinding electric motors and for 50 %of the motor-vehicle repairs.

3. At present no particular problems are said to be posed by spare-parts. It is to be remarked, however, that many sections of the works are presently operating at about 50 % of their capacity. The situation could become more critical in future.

4. The standard of training of labor is average, namely not too high. The need is felt for internal training schemes.

CONCLUSION

Maintenance seems to be properly carried out according to good preventive schemes. Little reliance seems to be placed on outside assistance, since the

workshop is designed to cover a large share of the factory's repair needs. Maintenance requirements do not presently pose any particular problems, the factory being run well under capacity.

It is to be hoped that this service will have reached its full efficiency in the next years, when the plant is expected to operate at full capacity. Stock inventory, skilled manpower and close supervision will then be mandatory.

Appendix 30
ISIC 350

METAL-BOX E.A., LTD., THIKA

Chief Engineer: Mr. Sullings

1. This factory was established 10 years ago, and its fortunes and develompent have been intimately bound up with the development of the country's food-industry. Indeed, it is strategically located both as far the raw material supply and product delivery are concerned. Most of its equipment appears to be modern, and the management is highly efficient.

2. It has an independent workshop, specially equipped for diemaking, a basic need for this kind of concern. There is a very good maintenance schedule both for machinery and dies.

3. The spare-parts stock is under good control. However, safety margins have to be higher than is usual in the case of other activities, particularly as far as special steels are concerned, since local availability (and reliability of that available) is a problem. The same applies as far as regards good quality raw materials (thin, tinned-steel sheets).

4. Skilled labor is essential for proper operation of the production equipment, as well as for maintenance of equipment, dies and tools. There is no internal training scheme, a liberal wage structure, good supervision and good man-management help solve most of the difficulties.

5. Production overall losses are estimated at about 10%, of which 2% due to machinery breakdowns and 4% due to die failures.

CONCLUSION

This is a sound and dynamic firm, whose peculiar needs are for sound well-kept dies, which is not an easy job. So every effort has been bent to this end, and it has been

achieved through very effective management, good stock control mainly for special alloy steels, a liberal wage policy and close supervision.

The figures quoted for production losses do not mean however, that each machine is run 90% or more of the working hours throughout the year. This percentage refers obviously to the production schedule, which calls for alternative use of different machines. The low rate of losses obviously indicates a timely performance of preventive maintenance, as compared with the scheduled production needs.

Appendix 31
ISIC 350

KENYA GENERAL STORES, MOMBASA

Manager: Mr. Shah

1. The firm was established in 1936 and was originally concerned only with imports and trade. Manufacturing started in 1962, and at present its monthly production is about 300 tons nails and 500 tons galvanized sheets for industrial sheds. Though no figures are available for comparison, this may well account for some 20% of the country's sectoral output.

   The layout and the machinery seem to be efficient, and the management sound. The laborforce is about 40.

2. There is a small independent workshop with a responsible engineer and 3 workers who deal mainly with dies repair and manufacturing. This is a very exacting job, so much more because special steels are not so readily available nor are they reliable. The routine maintenance schedule of the production machinery is directly performed by the operators themselves.

3. The machinery is of Japanese make, and the suppliers are said to provide very efficient assistance. The yearly consumption of spares is estimated to amount to Shs 3,000 against an overall capital investment of £ 25,000. A 3-month inventory is carried, which is well under the national average. This is largely made possible by the particular skill and diligence shown by the local forwarding agents.

4. The personnel is well-trained in routine jobs, and special jobs are often done directly by the head of the maintenance department. At the moment it does not appear that greater skill can be expected from the laborforce.

CONCLUSION

Maintenance and repair of this type of machinery and dies require trained production and maintenance labor as well as close supervision. The latter is

liberally and continuously given by the workshop manager who is the person who has assured this degree of efficiency.

The other usual shortcomings such as spares and special alloy steels are partly obviated by the management taking direct steps to speed-up Customs clearance procedures.

Appendix 32
ISIC 350

INDUSTRIAL PLANT E.A.,LTD., NAIROBI

Manager: Mr. H. Smith

1. The Company was founded in 1960. It operates at about 75% capacity and produces plant and vessels in stainless steel, common steel and aluminium for dairies and breweries. There is a Staff of 6, plus 60 workmen and 6 apprentices. The general organization of the factory is functional. There seems to be far more machinery than necessary (about twice as much, on average). It is valued at Lgs 20,000 and is in a very good state of repair.

2. There is no maintenance department, and no maintenance schedule is available. Two expert workmen satisfactorily carry out all the required maintenance by using machinery and personnel from the production departments as necessary. They also see to nearly all repairs as well. Stoppages because of lack of maintenance are said to be inexistent. Practically the only jobs done by outside repair shops are electrical repairs, and these are said to be well done but very expensive.

3. There is a spares store, which also carries spare tools, to a value of between Lgs 8,000 and 10,000. This is a by-no-means negligible stock, but it is said to give the minimum safety margin for smooth and continuous operation, taking due account of the normal reordering time of stocks. An improvement of clearing procedures in Mombasa and of in-land transport could perhaps be of great benefit in this respect.

4. The maintenance staff has no vocational training when taken on and must be trained in the factory. On routine jobs they have a good standard of efficiency, it is stated, but on other tasks their efficiency is barely 60 . Reference was made to the lack of welders specialized in stainless steel and aluminium, and of experienced setters.

CONCLUSION

The large excess of physical facilities allows for certain flexibility in maintenance procedures. As always happens in such concerns, maintenance is usually carried out jointly by production and maintenance men. The inventory value of spares seems to be grossly excessive, even taking account of the difficulties in clearing and overland transport. Closer control of inventory and maintenance procedures would no doubt reduce the inventory considerably.

Appendix 33
ISIC 350

HARTZ & BELL LTD., NAIROBI

Production Manager: Mr. Green

1. This is one of the most important mechanical workshops in the Country. It has 150 workers and a Technical and Drawing Office with a number of engineers for design work and for resolving technical workshop problems. The firm carries a fair quantity of technical literature and the general organization of the workshop is good. It has numerous machines in good order and the main jobs done are: turning, pressing, sheet-metal working, milling, gear cutting and plate rolling. There is also a foundry which produces very good cast iron and simple mouldings of aluminium and copper alloys, but not to any specific composition. This is, however, one of the few reliable foundries existing in Kenya.

2. There is no independent maintenance workshop, the production machinery being used for maintenance according to requirements. There is no preventive maintenance schedule, the efficiency of the machinery being the responsibility of the individual operatives and foremen. When overhauls are needed these are done by a few workers under the supervision of the foremen in charge of the machine under repair.

   The procedure is satisfactory, it is claimed; and no overall down-time is reported affecting the production schedule.

3. The store is carefully classified and controlled. It carries a reasonable stock of spares and a wide range of raw materials and commercial items. There are complaints about the shortage of special steels for tools, alloys to specification, and springs of various types.

4. Here again the shortage of skilled hands on the market was commented upon. Because of this, the firm has to train up new employees who often seem to have little bent for mechanical work. It is though that more careful

selection of those attending training courses, plus revised programs might well produce better results than those presently obtained.

CONCLUSION

This is one among the most reliable workshops in the Country, though it does not appear to be as close to international standards as it should be.

The major failures seem to lie in the production procedures, and this could well account for the general claims concerning the cost and quality of workshop services in the Country.

The workshop's maintenance procedures too may well adversely affect the quality and cost of repairs.

The size and importance of the firm call for a better maintenance service, which does not necessarily mean that physical and human production facilities should not closely collaborate with the maintenance workshop.

The statements quoted concerning down-times are apparently the result of wrong records, since it is actually very difficult with the present procedures to correctly allocated the total number of man-hours worked.

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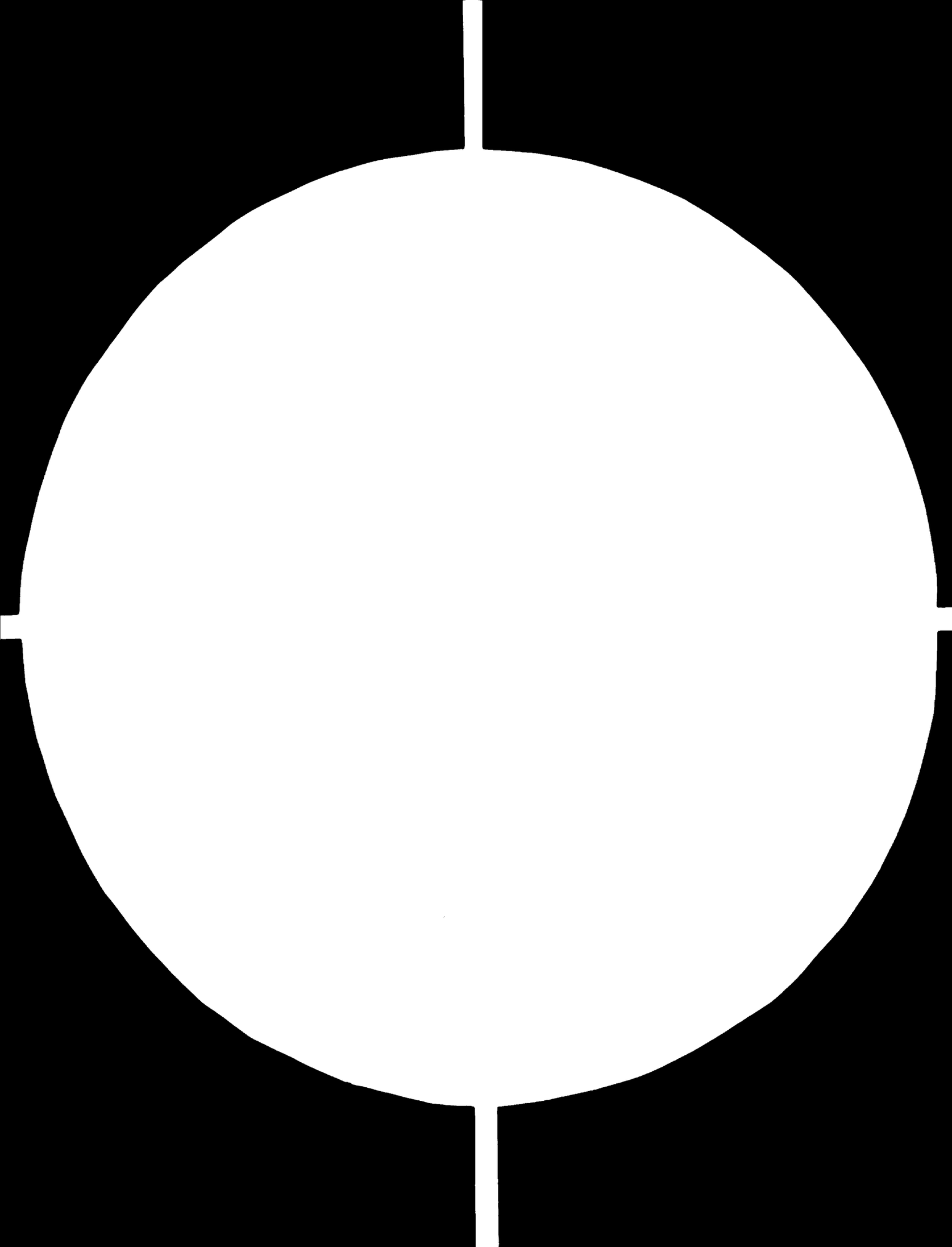

Appendix 34
ISIC 350

CONTINENTAL ENGINEERING, NAIROBI

Owner: Mr. Paglia

1. This is a typical, medium-sized, personally owned and managed workshop. It was founded in 1953 and has a payroll of 50 or so. It makes light and medium steel structures, plain and pressure tanks of up to 30,000 gallons and any kinds of mechanical jobs from drawings. It works to capacity, and its annual output is around 250 tons. It would like to expand, but apparently there is difficulty in raising credit. Furthermore the management appears to be barely adequate even for the present level of activity, and experienced foremen are especially lacking.

2. The equipment seems to be sufficient as regards numbers but it could be better maintained. The layout is not very rational, mainly because the available space is limited. The age of the machinery ranges up to 12 years.

3. There is no maintenance department, the workshop Supervisor being responsible for the efficiency of his machines.

   He services them as and when he considers this to be necessary. No informations were available on breakdowns.

4. The store is controlled by empirical and not very effective methods. Few spares are carried for the machine tools but there is a good stock of raw materials and commercial items. For the latter type, market availability is generally good, apart from special steels and alloys. So the inventory level for plain raw materials seems to be far to excessive.

5. The vocational capabilities and the output of the workers were severely criticized. It was also stated that it was virtually impossible to find skilled hands on the open market and that even those people who had followed courses are lacking in practical experience.

CONCLUSION

Though running at full capacity thanks to the market demand, the efficiency of the firm seems to be low and not in keeping with its importance.

Reasons for this may well be lie in the shortcomings so often claimed, namely lack of skilled labor and supervision.

But here the most important reason seems to be found in the fact that managerial advancement has not kept pace with the physical expansion of the concern.

Assistance should be given to managements such as this to help them operate using better technical and economic methods, improving efficiency and upgrading labor.

Appendix 35
ISIC 350

MINOR REPAIR WORKSHOPS

It may be said that, as a whole, the outside repair workshops constitute an important infrastructural service largely contributing to the country's industrial development. This being so, and in order to obtain as complete an understanding as possible of this service, in addition to the surveys of some of the most important workshops, the Mission also investigated a number of minor firms in each of the towns visited.

- in Nairobi: European Engineering, and Bruce Ltd.
- in Mombasa: The Italian Engineering Workshops
- in Nakuru: The Settler Engineers, Rivalco, and Angano Electrical
- in Kisumu: The Diesel Injection Service, Reliance Engineering, and Paramount Engineering.

These workshops have generally the following features in common: small size, over-age equipment, old fashioned management, undertrained labor and under-average job quality. Even so, the demand and prices both remain high. The economic aspect is aggravated by the generally high percentage of scrap, the often unsatisfactory results of the repairs, and thus the ensuing increased frequency of overhauls.

These minor workshops are mainly active in the motor-vehicle field, both passenger cars and industrial engines (trucks and tractors). As far as their specific activity is concerned, they fall into two categories:

- Workshops almost completely lacking machinery. These shops dismantle, check, send the appropriate pieces out for repair and re-assemble.
- Workshops whose activity is generally limited to repair or manufacturing individual parts.

The system prompts many criticisms, since firms in both groups do not generally come up to the required standards of equipment, organization and technical skill.

It should also be remarked that in most cases the engines sent in for overhaul have been completely ruined through prolonged wrong operation and through overly long-delayed light repairs.

From the foregoing it may be concluded that, in view of the present and future importance of the service rendered by this group of minor workshops, every effort should be made to raise their average standards while improving their costs and productivity.

Appendix 36
ISIC 370

MARRYATS E.A. LTD., NAIROBI

Manager: Mr. W. Hope

1. This is the most important electrical repairs and installations company in the area. It has 20 staff employees and 85 workmen. The firm has the agency for several European concerns for the installation and maintenance of goods and passenger lifts. It also does large-scale electrical installations, repairs electrical machinery and constructs transformers up to 50 kVA. At the time the Mission visited the firm it had a year's work in hand. There is not sufficient space available and the general layout suffers accordingly. The machinery seems to be in a fair state of repair but there does not seem to be sufficient to cope with the work load; in fact overtime often has to be worked.

2. There is no maintenance section, the production equipment being used as and when maintenance needs so require. A couple of workmen from the production department see to routine maintenance of the machinery, following some kind of general schedule. The Workshop Supervisor is responsible for the efficiency of the machines. No important breakdowns are reported to occur.

3. There is a materials store, but this too suffers through space limitations. It seems to be fairly-well controlled though the inventory appear to be much too heavy.

   It is said that delays between Mombasa and destination are excessive and that this appears to be due to the change in the port procedures. This is a very serious difficulty in view of the fact that 80% of the materials are imported.

4. The lack of skilled labor was underlined. This too is a very serious handicap which cannot be overcome because, for a variety of reasons, it is not possible to run training courses within the Company. The Manager considers that

there are not enough Training Centers in the country and that furthermore, the facilities available are insufficient to provide good craftsmen without further training in private companies.

CONCLUSION

Though making a major contribution to the Country's sectoral activity, this firm does not appear to be adequately operated. The high market demand has apparently stimulated increased production but this has not been matched by a similar advance in managerial techniques. This means poorly supervised manpower, low productivity, excessive stocks and, as a consequence, high repair costs.

As far as maintenance is concerned, this is actually carried out according to emergency needs, and cannot be very effective. Thus it is not understood how breakdowns may be negligible, as reported. No doubt there are no adequate procedures for allocating manpower or, if there are, they are wrongly followed.

The importance of the firm in this sector indicates the need for immediate assistance, in order to improve the availability and quality of this sectoral service and decrease its cost.

Appendix 37
ISIC 370

THE INSTRUMENTATION LTD., NAIROBI

Managing Director: Mr. O'Connor

1. This firm was established some years ago, and is engaged on the repair of any kind of instrument: pressure gages, electrical and electronic measuring and controlling devices, thermostats, timing devices, optical and medical instruments and so on. The laborforce is 12 to 14. Lack of skilled hands severely limits the firm's activities and indeed most of the men have to work 12 to 14 hours per day.

2. The premises are old but properly kept. The working equipment, instruments and devices, are all most efficient and properly used.

3. Considering the general scarcity of this type of repair service in the country and the efficiency of this concern, it is felt that it should be given some kind of financial assistance so that it can expand its activities to better meet present and future demand, especially in view of an increasing industrial automation.

Appendix 38
ISIC 381

AFRICAN MARINE ENGINEERS, MOMBASA

General Manager: Mr. Keymer

1. This is an old established shipyard, fairly well designed and equipped for building and repairing ships. It has a laborforce of 350, of which at least 100 are tradesmen as generally needed for this type of work. There is a variety of departments, for plate and iron working, forging, machining, foundry work, etc. Most of the equipment is old, but is sturdy and properly maintained. It also includes some large machinery which is not to be found elsewhere and can be of great help for out-door occasional needs.

2. There is rather a large excess of capacity in many departments, but this is often absorbed by frequent and unexpected peak loads so peculiar to the ship repair industry in an important port such as Mombasa.

3. However in implementing the project it might be well to consider:

   – expanding and modernizing the foundry department, to better meet the country's present and future needs, especially with regard to any future policy concerning the local production of spares;

   – making use of the great amount of space and physical facilities and experience available for a future Training Center.

   Both these aspects were discussed with the General Manager, and the conclusion was reached that a detailed study of such possibilities could well bring to an effective solution.

Appendix 39
ISIC 383

BURNS & BLANE (KENYA) LTD.

Production Manager: Mr. G. H. A. Birks

1. This is an important Company with a good general organization. It was founded in 1956 with a nominal capital of Lsg 130,000 and forms part of the LONRHO (London Rhodesia Co.) group. The firm produces caravans, tanker trailers, agricultural trailers and vehicle bodies. Although its equipment is efficient it is not laid out functionally. It has a staff of 20 and a laborforce of 80.

2. There is no maintenance department because the Manager does not consider one to be necessary. In actual fact, preventive maintenance is carried out at regular intervals but not to a scheduled program. Occasional repairs are done by selected men or by outside shops. Downtime amounts to something like 100 man-hours per month (it is reported), and may be considered to derive from the following causes: 50% from improper maintenance, 50% from wrong operation.

3. There is a spares store which carries fairly limited stocks because every effort has been made to standardize machinery and equipment. All items are fast-moving stock which is fairly comprehensive. There is little idletime because of lack of spares. Some of them may also be made by outside shops, but they are not seldom poor and always extremely costly. In the case of imported spares, the real hinge point is the speed of dispatch from abroad. According to the firm, the position has not been improved by the recent changes in cargo handling procedures. It is regretted that a flat Customs rate is levied on all imports irrespective of their nature (finished products, or single pieces which cannot be manufactured in the country). A graded tariff could favor the development of industry and the built up of greater stocks.

4. The workers are not trained and efficiency averages around 50%, it would seem. Hardly any of the workers have any basic education or vocational

training and even those who have followed courses are not sufficiently well skilled. The same applies for supervisors.

CONCLUSION

Though there is no maintenance department, the management seems to be maintenance-minded, and though carried out by unusual methods, maintenance apparently gives good results. The question may be posed whether or not these good results are obtained at optimal cost.

Inventory control seems to be very effective, taking account of the usual claims about the excessive length of time involved in reordering procedures.

Once again the level of training of labor and supervision is claimed to be low.

Appendix 40
ISIC 383

G. & R. (GAYLEY & ROBERTS) LTD., NAIROBI

General Manager: Mr. Hinds

Workshop Manager: Mr. Page

Stores Superintendent: Messrs Wright and Halas

1. This is the general agent for Caterpillar and John Deer with subagencies in the country's main towns.

   In Nairobi the firm has a large well designed and equipped workshop for assembling and overhauling tractors, and a large very well controlled spare-parts store.

2. The Company employes about 150, of which 120 in the xorkshops. It is a problem finding skilled personnel, and an internal training scheme is provided. The turnover is however very large both because trained men leave for higher wages, and others are fired for inefficiency.

   The lack of trained supervisors is even more serious. Indeed, it is stated, for instance, that assembling a tractor with a bad foreman takes more than twice the time required with a good one. Records are kept of tractors coming into repair: About 30 % of the repairs seem to be the result of wrong maintenance and operation.

3. The store carries out a large inventory which meets the demands of all the subagencies. Average yearly turnover does not exceed 40 %. Here again it is claimed that Customs procedures and inland transport contribute to the long delivery delays.

   The Mission had a lengthy discussion with G. & R. on a possible scheme for a bonded duty-free spare-parts store to be strategically installed at Mombasa as

a regional store for East Africa and neighboring countries. The complexity of the problem was recognized. Naturally it would have to be studied and discussed by the Governments and the main interested mother factories on a regional basis. It was however recognized that an optimal interregional solution could be reached through adopting operational research methods already widely used for this kind of distribution problem. This solution could well cut, by a large percentage, the overall inventory to be carried and at the same time drastically reduce delivery times.

Appendix 41

NAIROBI INDUSTRIAL ESTATE

Director: Mr. J. M. Shirvastava

This is the first of five industrial estates conceived by the Development Plan to stimulate individual small-scale enterprises among Africans.

It is located in the industrial part of the city and is provided with all the infrastructural services needed.

There is a central building for the offices and two large industrial sheds. Each of these is so designed as to be split up into several "units", each measuring 25' x 25'.One or more of these units can be rented at a reasonable price by small individual concerns.

The Estate provides such common services as:

- a maintenance and repair workshop, charging the service at cost;
- a Technical Office providing free advice for technical or managerial problems.

At the time of the Mission's visit, the Estate was at an advanced stage of preparation but was not absolutely completed. Four small firms had already set up, these are: a clothing firm employing about 15: a firm making steel window frames and employing 5 workers; a six-man firm making metal hinges; and a firm which was just moving in and which, it was said, would employ about 10 people making plastic and leather bags for women.

It is thought that this experiment may prove to be a valuable tool for future development of small African entrepreneurs.

Appendix 42

EDUCATION AND TRAINING

1. General education in Kenya starts at the age of six. Boys who have received the KPE Certificate (Kenya Primary Examination) on the completion of seven years primary education, may enter the Secondary Schools for a 4 year period. Secondary education in technical subjects is given at the Secondary Technical School (4 year courses for "Junior Technicians" and 3 year for craftsmen), or at the Trade Schools (2 or 3 year courses for craftsmen only). Apart from theoretical instruction Junior Technicians are given the choice between two types of workshop practice: Mechanical and Electric Engineering or Mechanical Engineering and Building. Craftsmen can choose from: Mechanical Engineering, Electrical Craft Practice, Motor Vehicle Engineering, Plant Mechanics. A five day week is worked. 45 periods of lesson or practice are given each week. Each period consists of 40 minutes.

2. The Mission was informed that there are Secondary Technical Schools in: Kabete (established 1924, output 150 students per year) – Singalagala (est. 1946, output 100) – Rift Valley (est. 1964, output 60) – Thika (est. 1949, output 100) – Machakos (est. 1960, output 70). Total annual output 480 students. The schools at Kabete and Rift Valley were visited by the Mission. They appeared to be efficient though it seems that the output of students could be increased, on the programs made more comprehensive, by running them on a 2-shift per day basis.

3. There are Trade Schools in Meru, Mawego, Kaiboi. The output is not exactly known.

4. Besides the above Schools there exist also the Kenya Polytechnic in Nairobi which has been visited by the Mission and the Technical Institute in Mombasa, both of them providing higher technical education.

5. Vocational training of apprentices is regulated by a law called "The Industrial Training Ordinance". Training will be carried out at the new Nairobi National Industrial Vocational Training and Trade Testing Center, which was visited by the Mission and was expected to start by early 1969. There will be 4 types of course: Instructor Training (40 pupils p.a.) – Foremen Training

(100 p.a.) – Upgrading of workers (400 p.a.) – Specialized Apprentice Training (about 100 p.a.).Training will be offered in the following Basic Trades: Metalworking, Building, Electrical, Vehicle and Plant Repair, Welding, Woodworking. The Standard Apprenticeship Course lasts 4 years the breakdown being as follows: 12%special theoretical instruction at the Polytechnic, 25% basic training at the Center, 63% in-plant training in industry. Besides the Standard Apprenticeship Course another alternative scheme will be offered with the purpose of giving more limited practical training and covering only few types of trades (welder, fitters, bricklayers, etc.).

6. Shortly another training center, sponsored both by the Kenyan and Danish Governments, is expected to start in Kisumu. Facilities already exist but instructors seem to be lacking.

7. To complete the picture of the present situation as regards training, the Nairobi Management Training and Advisory Center must be mentioned. This Center has been visited by the Mission and appeared to be extremely efficient. Its objective is to provide services to management in furtherhance of the National Development Plan, such as: management consulting, management training, profitability audit, personnel appraisal. A maintenance management and a maintenance supervision course are offered as well.

8. The following institutions concerned with education and training programs have been visited:

- Ministry of Labor National Industrial Vocational Training and Trade Testing Center, Nairobi;
- Kenya Polytechnic, Nairobi;
- Kabete Secondary Technical School, Kabete;
- Nakuru Training Center, Nakuru;
- Management Training and Advisory Center, Nairobi;
- Federation of Kenya Employers, Nairobi;
- East Africa Association of Industries, Nairobi;
- Ministry of Works' Workshop, Nairobi;
- Railways' Training Center.

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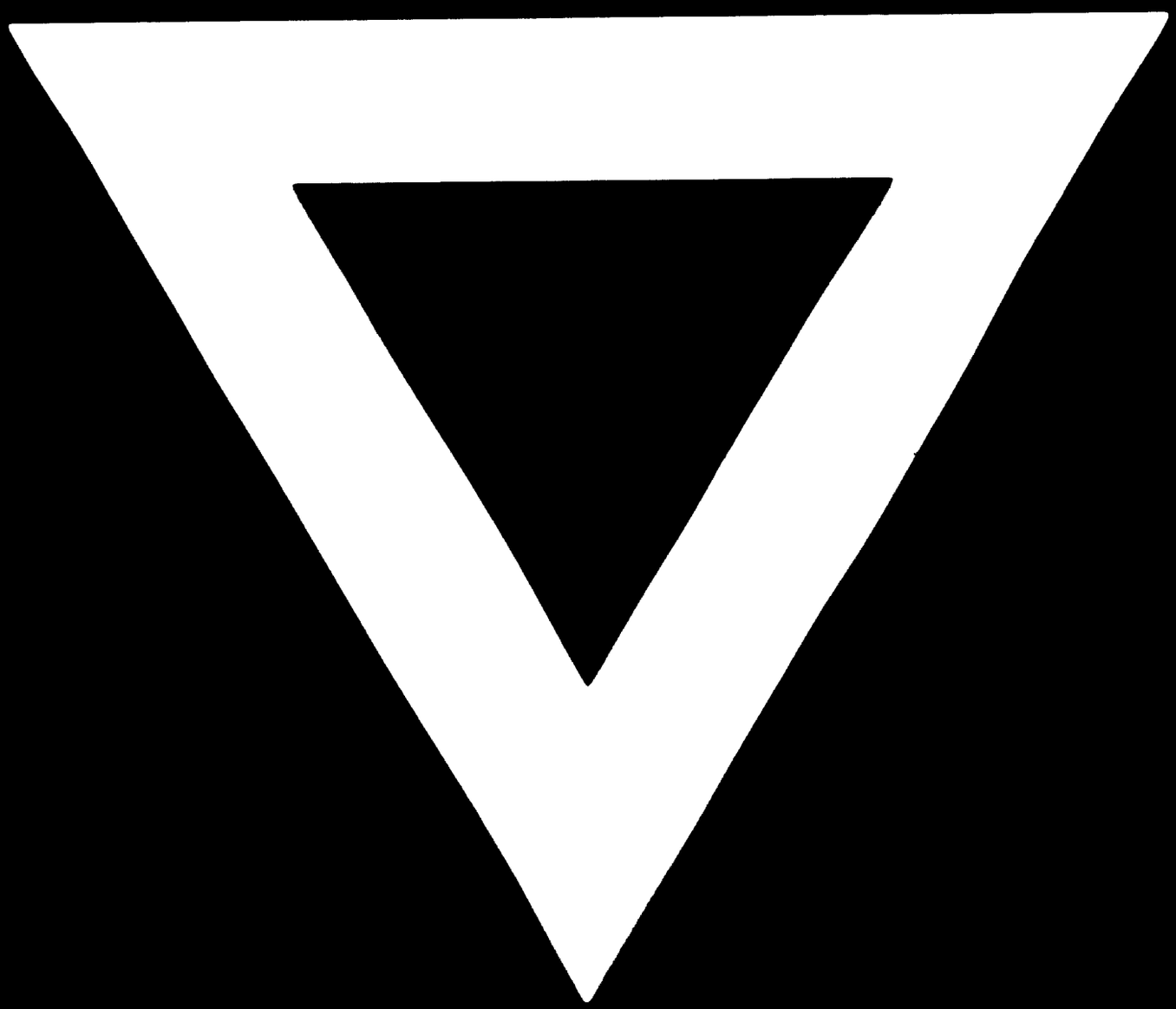

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