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REPAIR AND MAINTENANCE OF INDUSTRIAL EQUIPMENT IN JAMAICA

SALZGITTER INDUSTRIEBAU GMBH

JUNE 1969

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards even though the best possible copy was used for preparing the master fiche.

Salzgitter Industriebau
Gesellschaft m b H

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Repair and Maintenance of Industrial Equipment

in

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prepared by

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Federal Republic of Germany

for

United Nations Industrial Development Organization

June 1969

S/F Repair and maintenance
C/F JAMAICA

Salzgitter Industriebau
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Table of Contents

page

INTRODUCTION

The Industrial Development Board of United Nations Industrial Development Organization (UNIDO) considers the possibility of giving special assistance to the repair and maintenance of industrial equipment in countries under development and is, therefore, interested to be informed about ways and means whereby this goal can be achieved. In this connection, UNIDO starts from the right point in considering that if funds are available and are used for repair and maintenance, there is every prospect of achieving a great positive effect within the framework of the industrial development. For enabling to establish an efficient programme for such technical assistance, UNIDO ordered to carry out studies regarding the specific problems in selected countries which, amongst others, include Jamaica.

In consequence, it was required that those studies should be directed to provide recommendations which might be described as optimum solutions under the prevailing particular conditions and which would make it possible for UNIDO

(a) to choose amongst the countries investigated those in which it would be recommendable to start implementation of the campaign;

(b) to formulate a long-term working programme for the technical assistance to be rendered to the countries chosen;

(c) to identify crucial fields in the surveyed countries, in which assistance is urgently needed. This will enable UNIDO to render such assistance as quickly as possible;

(d) to help UNIDO in drawing up a long-term policy for assisting developing countries in the field of repair and maintenance.

The required investigations in Jamaica were carried out by an expert team of Salzgitter Industriebau GmbH, Federal Republic of Germany, during the period January 3 through January 22, 1969. Salzgitter Industriebau GmbH gratefully acknowledge their debt to all who granted valuable advice and unselfish support in these investigations and were always ready for immediate discussions. From the survey regarding repair and maintenance in Jamaica, Salzgitter Industriebau GmbH have concluded several proposals for UNIDO and they are convinced that the complete or even partial materialization of these proposals will contribute essentially to the further industrial development of the country.

SUMMARY AND CONCLUSIONS

Until very recently, the economy of Jamaica was predominantly agricultural, but the rapid growth of the bauxite industry and the development of manufacturing industry during the last two decades have produced a structural transformation towards industrialization.

Purchase of equipment both for operational and maintenance purposes is not a matter of the funds involved or lack of foreign exchange. However, there is a certain lack of standardization.

The stocking of spare parts is a problem due to inadequate organisation systems and difficulties in supplies.

With certain exceptions the management attitude towards maintenance is poor. Preventive maintenance is mostly unknown and there is only a fire fighting type of maintenance.

There exists an absolute lack of skilled personnel at all levels in the field of engineering, business administration and the managerial side, which affects repair and maintenance strongly negativ. Assistance is obviously needed and can possibly be established in the fields of

standardization
adequate technical information
organization
maintenance demonstration
training in all fields and all levels

particularly for instructors for important in-plant training schemes. For the time being, only bauxite, tourism and the food and beverage industries do not need assistance. This latter statement is true also to the communication sector except, telephone services.

ECONOMIC BACKGROUND

(a) National Economy

Until very recently, the economy of Jamaica was predominantly agricultural, producing sugar, bananas and other tropical fruits for export. But the rapid growth of bauxite mining and alumina production, and the development of the manufacturing industry during the past two decades have produced a structural trend towards industrialization.

Manufacturing today accounts for some 15 per cent of GDP. In the last five years, GDP from manufacturing has increased from £ 39.4 million in 1963 to about £ 50.7 million in 1967. This latter year shows an increase of only £ 1.2 million, of 2.4 per cent over the 1966 figure. This is not truly indicative of activity in this sector. Many of the industrial sub-sectors showed significant increases while a large reduction occurred in the contribution of sugar, molasses, rum and footwear. The situation in 1968 is expected to be favourable (see table 1).

(b) Diversification

Furthermore, the growth of the industrial sector has been accompanied by a diversification of the sector and a widening of the range of products made in the island. Prior to the 1950's, the sector was based mainly on the processing of

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TABLE I

Contribution of Manufacturing Sector To Gross Domestic Product
At Factor Cost (Current Prices): 1963 - 1967

(£'000)

	Industrial Groups	1963	1964	1965	1966	1967
	TOTAL	39,364	42,165	44,636	49,501	50,664
1.	Food (excluding sugar)	7,848	8,815	9,480	10,550	10,748
2.	Sugar, rum, distilling and molasses	8,391	6,926	6,514	7,291	5,649
3.	Alcoholic beverages (excluding rum)	2,186	2,411	2,643	2,874	3,140
4.	Non-alcoholic beverages	943	1,044	1,106	1,224	1,308
5.	Tobacco and tobacco products	2,149	2,801	2,221	2,420	2,554
6.	Textiles and made-up textile goods	2,822	3,242	3,487	3,785	4,041
7.	Footwear	635	724	701	729	653
8.	Wood and wood products (excluding furniture)	937	1,057	1,128	1,200	1,302
9.	Furniture and fixtures	1,643	1,730	1,834	1,990	2,267
10.	Printing, publishing, advertising and paper products	2,397	2,734	2,964	3,328	3,692
11.	Leather and leather products (excluding footwear)	186	188	225	231	231
12.	Chemicals and chemical products	1,750	1,942	2,278	2,511	3,142
13.	Cement and clay products	2,456	2,905	3,432	6,443	6,787
14.	Metal products and repairs	4,144	4,682	5,608	6,443	6,787
15.	Miscellaneous manufactures and repairs	882	951	1,017	1,129	1,199

local agricultural products and the production of a limited range of consumer goods such as sugar, rum, cigars and cigarettes, non-alcoholic beverages and a range of food products for both local consumption and export. Many new industries have come up in the past ten years, some aiming primarily at the local market, and other ones at the export market. Among the products of these new industries are such commodities as textiles, clothing, footwear, cement, containers, paints, industrial chemicals, some petroleum products, ceramics, etc. Besides the traditional agricultural products, including sugar and rum, only bauxite is of major, and cement, furnitures and certain chemicals products are of some minor importance for export trade.

(c) Development Indicators

Two of the most important indicators showing the trend of industrial development are the consumption of electric power as well as steel consumption per capita.

The total electric power generated in 1967 were 962 million kWh, an increase of 94 million kWh or 11 percent compared to 1966 (see Table 2 and 3). Statistical information about the development of the per capital steel consumption was not available.

TABLE 2

Electricity Generated and Sold by the Jamaica Public Service Company 1963 - 1967 in Million kWh

Year	Electricity Generated	SALES					
		Total	Residential	Commercial and Industrial	Other	Company use	Line Losses
1963	366.4	320.4	77.9	224.1	18.4	1.2	44.7
1964	422.9	373.2	87.6	263.8	21.8	1.3	48.4
1965	491.4	430.5	100.1	306.8	23.7	1.3	59.7
1966	544.0	474.4	117.7	310.0	46.7	1.4	68.3
1967	603.0	529.9	134.2	341.0	54.7	1.6	85.5

TABLE 3

Major Private Electricity Generation in Million kWh

Company/Year	1965	1966	1967
Bauxite Companies	207.8	217.1	256.9
Sugar Factories	59.0	58.0	57.8
Caribbean Cement Company	39.6	48.2	44.0
Total	306.4	323.3	358.7

(d) Incentive Measures

The rapid growth of manufacturing was greatly facilitated by a combination of appropriate policies and incentive measures on the part of the Jamaica authorities.

The incentive laws such as

Industrial Incentive Law
Export Industry Encouragement Law
Pioneer Industry Encouragement Law
Cement Industry Encouragement Law
Textile Industry Encouragement Law
Hotel Incentives Act

are administered by the Jamaica Industrial Development Corporation (JIDC).

Financial assistance was extended by the Development Finance Corporation which is being transformed into a new development bank since Jamaica entered Caribbean Free Trade Association (CARIFTA).

(e) Protective Measures

The economic expansion seems to be somewhat throttled by reduced purchasing power of the population due to excessive prices.

The reason may be found in the fact that young industries have an almost entire protection against any world market competition whatsoever.

This protection at all costs gives rise to careless methods of calculation, including extreme profit margins which are added to the already high production costs. This results in an inverse effect on the essential fundamental idea of maintenance, in particular of preventive maintenance, namely decrease of production costs by increased utilization of the production capacity, a consequently increased purchasing power, and finally the positive effects of the economies of scale.

Consideration could be given to imposing on the promoted companies certain provisions with regard to maintenance, which might create positive effects as described above.

(f) Reorientation of Industrial Policy

Industrial policy is largely formulated by the Ministry of Trade and Industry and over the years has been guided by such criteria as employment effects, import substitution and export promotion. Officially sponsored industrial development has contributed to the pace of industrialization, but it has frequently tended to promote establishments of a "cutting and wrapping" variety which are heavily dependent on imported materials the value of which, increased by manufacturing, is minimal.

A reorientation in industrial policy is laying greater emphasis on the establishment of companies with prospects

of achieving operating efficiency by means of economies of scale and by relying more strictly on local sources of material supply.

(g) Prospects

The prospects for a steady growth of the Jamaica economy,and particularly the manufacturing sector, are very favourable provided the authorities adequately cope with the new lines of industrial policy.

FACTS CONCERNING REPAIR AND MAINTENANCE FOUND DURING THE CARRYING OUT OF SURVEY

1. Important Industries

   (a) Number of firms of reasonable size and the type and volume of manufacture they are engaged in. A group of small firms, which engage in the same type of activity, and which may form an important activity as a group, will also be of interest.

   - The manufacturing sector of Jamaica's economy is in the very first stages of its development. The officially sponsored industrial development has contributed to the pace of industrialization but it has frequently tended to promote establishments of a "cutting and wrapping" variety. With the exception of the following sectors

     Bauxite
     Cement
     Sugar and Rum
     Food and Beverage Sector
     Refinery and the
     Jamaican Omnibus Service (JOS)

     the firms have not reached reasonable industrial sizes so far.

     There is no reliable statistical information available about number and types of firms. The possibility of

establishing such a roster containing the required information was discussed with JIDC. Preparing such a roster will be time consuming but a respective recommendation would be strongly backed by JIDC and Jamaica Manufacturers Association (JMA).

JIDC could be the right counterpart for the implementation (see recommandation).

(b) Age of the firms and other pertinent information see explanation 1(a).

Except the sugar industry all firms within the other sectors have been established during the last two decades only. A certain number has been developped from being trading companies in former times into manufacturing firms of today.

(c) Importance and impact on national economy see explanation 1 (a).

Starting in the early fiftieth the bauxite and alumina industry has shown a rapid growth and is by all means the most important sector of Jamaica's economy. Jamaica is by far the largest supplier of bauxite throughout the world. Its exploitation is done exclusively by foreign companies.

Tourism belongs to the islands leading industries, second only to bauxite in its economic importance. It is expected to have about 2 million visitors annually in the early seventieth, triple the number of today. The food and

beverages industry is the largest sector within the manufacturing industry. Worthwile to mention is furtheron cement production and the recently growing tyre manufacturing, the latter dominated by foreign interests.

(d) Importance in the field of export, see explanation 1 (a)

Traditionally the agricultural products such as

sugar including rum
tobacco
spices , and a
variety of tropical fruits

are important for Jamaica's export trade.

Within the last decade bauxite and tourism have been able to surpace the value of agricultural exports and are expected to grow even faster.

With the exception of deliveries within the Caribbean Free Trade Association (CARIFTA) almost all other sectors are producing dominantly to meet Jamaica's local requirements and to substitute former imports as far as possible.

(e) Type, age and condition of equipment in the different firms

- Installed Operational Equipment
  All designs of operational machinery and equipment of all ages dating back to times before World War I up to very recent designs are installed within the manufacturing sector. This includes the very modern

designs such as semi and fully automatic equipment. In most cases it has been declared that purchasing new equipment is not a matter of money involved or lack of foreign exchange.

The latter statement is not valid regarding the sugar and textile industries as well as to the regular public passengers road services.

- Condition of Equipment
  The condition of equipment is mostly not comparable to the standards in industrialized countries due to the following facts:

  . lack of skill of operational staff, which is not able to handle the equipment properly;

  . lack of skill and knowledge of adequate methods, techniques and routines of maintenance including lubrication;

  . no implementation of necessary methods of preventive maintenance;

  . no introduction of adequate measure for conservation to avoid negative effects of climate (e.g. humidity).

  This results in a gradually lower average life expectancy for equipment. This effect is, however, mostly not measurable.

- Information about Suppliers
  There was an absolute lack of world-wide information about potential suppliers for all types of equipment.

- Maintenance Equipment
  Regarding specifically maintenance equipment prevails the same situation as for operational equipment. Generally there is no satisfying relation between the physical conditions of modern operational equipment and specifically maintenance equipment which was found often in a most worse condition, but some positive exceptions prevail in the sectors mentioned under para 2 (a) below.

2. Existing Repair and Maintenance Physical Facilities

(a) Survey of existing repair and maintenance facilities in the different factories and in the country as a whole; are there independent repair and maintenance sections in the different factories with responsible managers and are there repair and maintenance programmes or any being planned?

- Certain sectors of the Jamaican economy for which repair and maintenance is equal to dead or life, such as:

  Sugar Industry
  Cement Industry
  Textiles Industry
  Railway Services, and
  Bus Services

  have implemented independent maintenance departments.

These are headed by responsible managers, are equipped specifically to meet repair and maintenance requirements, and have, to a lower extent, specially trained personnel. The past efforts to maintain its equipment were successful to a certain extent, but still further improvement is necessary and possible.

- The sugar industry has two crops annually and performs the necessary maintenance work during the normal out-of-crop times. Repair and maintenance programmes are established but their effects differ within the sector.

- The cement and textile industries have recently acknowledged the possible benefits of a maintenance system and are just now in the stage of implementation. Positive results of maintenance have been recorded from both sectors, but the cement industry is by far more advanced.

- The railway network consists of only 241 total track milage and is owned and operated by the Jamaica Railway Corporation. The corporation has completed dieselization programme and is still aiming and successful at the modernizing and proper maintenance of its equipment. In this way the corporation is regaining the passenger traffic that it lost in the past. On the other hand freight traffic is the more important part of the services.

. The road system consists fo 2682 miles of main road, of which 1730 are asphalted, and 7047 miles parochial and subsidiary roads. The conditions of the roads needs improvement by better maintenance.

. Regular public passenger services are available on 357 routes serving all areas outside Kingston. The more important urban and suburban services in Kingston are provided by Jamaica Omnibus Services Ltd. (JOS) under franchise. Its fleet consists of 343 Diesel omnibusses. A special repair and maintenance section is established as well as a maintenance programm which, however, needs improvement. The road freight traffic is provided mostly by single contractors who depend on the automobile service centres for repair and maintenance requirements.

. The Ministry of Communication and Works has established a remarkable repair and maintenance department of its own, the Public Work Department (PWD). PWD covers all repair and maintenance work in the public sector, is adequately equipped and organized and has partly well trained personnel.

Maintenance programmes have been established for road building, civil engineering, protection of public buildings including hospitals and all types

of electrical and mechanical engineering purposes. These programmes are planned to be extended in the near future.

- Within the remaining private sector of the manufacturing industry, trials to establish independent repair and maintenance sections are found only to a lower extent or non at all. The decision to establish such a department depends today on the importance of the company and its possible foreign influence by capital or by education.

  . Smaller sized firms in the food and beverage industries are actually starting up such independent departments. But even in cases where the first steps have been past in establishing such independent departments remains still a lack of specially assigned personnel, managers as well as workmen which have to be provided from operational departments from time to time, if necessary.

  . In the footwear industry for instance it was recorded on the other hand that all repair and maintenance jobs to be done are executed by own maintenance personnel and equipment but the programme does omit reconditioning of operational equipment as normally done in industrialized countries.

Summarizing, it was found that within the remaining private sector of the manufacturing industry the independent repair and maintenance units are existing frequently in the organization plan only but are not realized. On the other hand established programmes are not advanced as far as they should.

(b) Survey of centralized repair shops, with volume of work, type and condition of equipment, and quality of work. Are these shops privately owned or Government owned?

- It has been ascertained that for the carrying out of repair and maintenance work, preference is given normally to the employment of the producers' own equipment and labour as far as available.

  Only where the production unit is definitely too small or where distinct specialist work has to be performed use is made of the services of local contractors.

The only existing centralized repair shop was described under para 2 (a) page 18 and has been established by the Public Work Department.

In addition, the following compilation shows a number of reliable contractors in the field of mechanical engineering as well as electrical engineering, which, however, are not centralized repair shops in the real sense.

Mechanical Engineering

Reginald Aitken Ltd.	Pumps, steel buildings, trucks, irrigation equipment
Kingston Industrial Works Ltd.	Machine shop, steel fabrication, sugar equipment, foundry work
Kingston Industrial Agencies	Motor vehicles, trucks bodywork, sugar machinery
Todd's Engineering Works Ltd.	Tanks, trucks body building, small machine shop
Kelley Engineering Works Ltd.	Structural steel, trailers, tanks, small machine shop
Moseley Engineering Works	Pumps, machine shop
Antilles Trading Co. Ltd.	Steel buildings, sewage equipment, agricultural equipment
Geddes Refrigeration Ltd.	Air conditioning, freezing
Wonards Engineering Ltd.	Air conditioning, freezing
Conditioned Air Corporation Ltd.	Air conditioning, freezing

Electrical Engineering

Bicknell & Silvera Ltd.	Transmission lines, motors, switchgear, wiring of buildings
R.A. Silvera Ltd.	Transmission lines, motors, switchgear, wiring of buildings
Armature & Motor Winders Ltd.	Rewinding of motors
Kingston Industrial Works	All types of electrical engineering work
Veterans Air Conditioning Co.	Wiring of buildings
Hinds Brothers Ltd.	Wiring of buildings
H. Little Associates Ltd.	Wiring of buildings

This list does not claim to be complete. Only those firms have been listed that have been known to the team either by visits during the investigations or by recommendation during discussions with important clients of these contractors.

Regarding the quality of work performed by this contractors it has to be stated that nearly all types of work are lacking quality standards as normal in industrialized countries. By using more adquate routines, techniques and methods the quality of work performed by the above listed contractors could be improved. There are very few exceptions where repair and maintenance jobs performed were judged to be of

high quality. However, under the prevailing conditions in Jamaica the contractors are trying hard to reach the highest level possible. All the shops listed are privately owned. In the public sector it is only the shop of PWD who is using partly the service of the private contractors listed above.

(c) Availability of Spare Parts and Restrictions, if any, for their importation.

- Protective measures for pioneer manufacturing industries are provided.

  These measures, however, are for the time being not effective regarding the manufacturing of spare parts in the island. There is today no restriction so far for importing necessary spare parts.

  It is up to the discretion of spare part consumers whether they use local manufacturers of special spare parts or not. The sugar industry for instance uses partly local contractors for the reconditioning of equipment.

- Spare part supplier agencies
  The most common complaint within industry was that of negligence by suppliers' agents in Jamaica who do not have reliable stocks of spare parts in the island.

- Pretended savings on own stock

The natural reaction of the manufacturing industry is to have stocks of spare parts of their own. But entrepreneurs are not inclined to invest too much for such stocks due to lack of handling systems and skilled personnel as well as they believe that this method is uneconomical, as the short distance to suppliers in USA, who mostly have distribution agents in Miami, Florida, exempts them from holding large stocks. It was stated that normally delivery is expected to take by air freight only 2 days, by shop only 5 - 6 days and in urgent cases a man can even fly up to Miami.

- Delivery times

In spite of the arguments stated above it was claimed in many cases, that factories were short of spare parts owing to too long delivery times. That means that entrepreneurs act unrealistic not taking into due consideration the prevailing situation in Jamaica, and on the suppliers markets. For instance delivery times are in certain cases

by ship from USA 3 - 5 months

by ship from UK/Continent 4 - 6 months,

in extreme cases there were recorded delivery times up to 8 months even from suppliers from USA. This management attitude is at least partly unrealistic and has to be changed in order to improve the situation.

- Distortions of spare part supply
  The reasons for distortions are claimed to be as follows:

  . negligence of foreign suppliers even to confirm orders
  . inability of foreign suppliers to meet demands at all
  . too small orders from Jamaican clients
  . time consuming custom clearance in Jamaica which seems to be better in cases of airfreight supplies.

(d) Availability of spare parts manufacturing facilities
Quality of parts produced and, if possible, ratio of locally manufactured parts to total consumption.

- Local Spare Parts
  For the time being no real spare part manufacturing industry exists. However, some of the local repair and maintenance contractors are engaged in manufacturing urgently needed spare parts but only in small numbers and by order. Regarding tyres a recently established and foreign influenced manufacturing unit is able to meet local requirements of normal sizes.

  . Regarding quality of urgently needed and locally produced spare parts the same statements are given for quality of work performed by repair and maintenance contractors in para 2 (b). That means, with few exceptions, quality is not sufficient. In all fields the ratio between local manufactured parts and total consumption is about 1 to 10.

(e) Availability of adequate stores

A gap to be filled is generally the lack of adequate systems for visualized cardex or even computerized systems for a reliable stockholding of spare parts.

The problem, however, is more important than just to implement the above-mentioned systems. What is lacking to a greater degree is the availability of staff who could properly use the systems to be introduced in the warehouse.

Even where stockholding systems are already established (e.g. automobile repair shops and the above-mentioned sectors under para 2 (a)), they are not to be judged as adequate due to lack of skilled personnel and low investment in spare parts.

3. Prevailing Conditions of Repair and Maintenance Activities and Diagnosis

(a) Are present facilities of repair and maintenance adequate?
If not, indicate aspects that will give an idea on the magnitude of inadequacy, such as production lost because of repair and maintenance, idle time in important factories and for certain expensive machines.

- Aversion to Maintenance
As in most cases consideration of profitability of maintenance is obviously not taken into due consideration for the time being, maintenance is looked upon as a "necessary evil".

- Reasons for Maintenance
In order to judge the adequacy of existing facilities and activities for repair and maintenance the general aspects of maintenance are:

. in the economic sense - to reduce operating costs with less downtime
fewer repairs
less production losses
utilization of manpower at higher percentage
to lengthen life expectancy of equipment, and consequently better utilization of fixed assets.

- in the technical sense - to indicate cases in which a minor repair or adjustment will prevent a major break-down

- in the sense of human considerations - to take safety measures which are, if at all, often only partly carried out to prevent accidents which could cause injury to an employee or cause a production loss.

- Maintenance Systems of Important Sectors

In para 2 (a) it was mentioned that certain sectors of the Jamaican economy for which repair and maintenance is equal to dead or life, such as

Sugar Industry
Cement Industry
Textiles Industry
Railway Services, and
Bus Services

have tried to establish independent maintenance departments and even preventive maintenance programmes, or are just in the implementation stage.

The adequacy or efficiency of such systems, however, is lacking in so far as integral and important components for executing repair and maintenance properly, namely the supply of spare parts as well

as the availability of skilled personnel, and to a lesser extent the condition of equipment, are insufficient.

Only due to the high level of skill and experience of the responsible managers of the independent repair and maintenance sections, worse situations can be overcome and keep the production running. The above-mentioned industries engage partly foreign trained Jamaican engineers as responsible managers for such purposes.

- Maintenance Systems in the Remaining Industries

  . In the remaining sector of the private manufacturing industry, the adaptation of maintenance systems or programmes has taken place only to a lower extent, or not at all. This is to be judged as inadequate.

  . Though often exists a fire fighting type of maintenance - rushing from one breakdown to another and trying to keep factories running under anyhow even if an appreciable slowdown of efficiency occurs.

- Maintenance Programming

  A maintenance programme has to be sold from down up to the managerial levels. Management must realise that good maintenance saves money. Therefore maintenance has to stand equal to the other functions production and sales.

  Programming of maintenance is, if at all, still in the implementation stage.

- **Maintenance Versus Production and Sales**
  Management must accept that maintenance cannot be totally bound to the aspects of doing repairs only when production and sales say that they can. This conceptional goal is mostly not adopted in managerial circles and hence brings structural distortions.

- Maintenance and Newcomers in Industry
  Obviously the development of the economy and particularly the manufacturing sector has been too fast, as some minor and medium sized entrepreneurs are still what they had been in former times - traders and merchants - and have not become industrialists in a modern meaning of the word.

- **Reversion of Cost Factors**
  Entrepreneurs often do not yet realize, that the cost components

  production, labour,
  and maintenance

  will not remain in the day's situation but enter into a reverse position.

- **Level of Wages**
  Work today is carried out by cheap labour, even with low rates of overtime pay. In a rapidly growing economy, wages will normally rise subsequently but

with a certain time lag. As labour costs are not controlled independently by the entrepreneurs, an additional investment for maintenance equipment in order to establish some preventive maintenance methods or techniques will comparatively be cheaper.

- Timing of Reversion
  As a matter of fact the above-mentioned reversion is already occurring today but is unrecognized, as labour costs, due to lack of skill and consequently higher input, reach a high total and should be compared to those of capital investment.

Summarizing the above statements it can be said that the existing facilities of repair and maintenance are only partly complete or adequate. This also applies to firms which have already adopted maintenance systems or still have only the fire fighting type of repair.

- Production lost because of inadequate repair and maintenance
  In most of the companies visited, with exception of the sugar industry, it was stated that the real capacity of machinery and equipment in the productive sections is not known exactly due to lack of comparison possibilites.

Due to this fact is was hardly possible to evaluate a realistic relation between capacity and production loss due to repair and maintenance.

The only reliable indicator available is the relation between capital invested for production equipment and spare parts in stock. In industrialized countries this relation is considered to be adequate if 4 to 5 percent of the capital invested is available in spare part stocks. This ratio differs slightly between different sectors of industry with the exception of automobile service centres for which spare parts at hand reach a higher percentage.

In Jamaica it was stated that the value of stocks at hand varied between 0 to 2 percent only which is absolutely insufficient. On the contrary, taking into due consideration the prevailing delivery situation for spare parts in Jamaica, the percentage of stocks at hand should be even higher than in industrialized countries.

The effects of an adverse balance of spare parts in stock have been proved by high down times because of repair.

(b) Industries or Industrial Equipment in which the Problem of Repair and Maintenance is particularly acute.

- It are obviously the smaller firms within the manufacturing industry, in which the problem of repair and maintenance is particularly acute. The only remarkable exceptions are larger sized firms of the food and beverage sector, where repair and maintenance systems are adequate or promising to be improved furtheron.

- Besides the manufacturing industry were mentioned and described certain other industries in para 2 (a) and 3 (a). Here the real sense of repair and maintenance is adopted, but the systems established are incomplete for the time being. However, the problem of repair and maintenance for road traffic - passenger service as well as freight services - and the telephone service within the communication sector needs some special attention. By advice of the Jamaican Government firms within the bauxite industry were not visited. However, as this industry is totally foreign influenced one can assume that repair and maintenance systems are well established. This was proved during discussions outside the bauxite industry.

(c) Factors affecting the adequacy of repair and maintenance facilities and grading of these factors according to their importance and impact.

During the visits of the companies it has been declared frankly that purchasing new equipment - productive as well as repair and maintenance equipment - is not a matter of the money involved or lack of foreign exchange with few exceptions (e.g. sugar).

The reasons for inadequacy of repair and maintenance facilities is therefore not a restriction whatsoever has to be purchased.

The main reasons graded by their importance have been found as follows

manpower

lack of sufficient spare parts and lack of adequate stockholding systems

a general trend to achieve high level of profits as against lowest input of necessary capital and to a lesser extent the poor condition of maintenance equipment and lack of maintenance programming.

- Manpower
  - Importance of local manpower
  - This is the most important problem. It overshadows the whole situation.

. Lack of skill at all levels

There is a wide-spread complaint regarding the lack of skilled personnel at all levels especially in the fields of

mechanics and electricians
engineers
business administration
managerial supervision.

. Training by repetition

In the field of engineering, draftsmen at the lowest level learn their job not by education or training but only by experience and by repeating the same activity year after year. They are, therefore, not interchangeable and have to be given additional training if general changes due to modern production methods occur. What they miss is an adequate basic knowledge of the sciences due to the generally low level of education.

. Education and experience

Graduates of Technical High Schools and Technical Colleges have on the other hand gained this basic knowledge but are lacking in practical experience. Having a certificate of education, they are often not willing to undergo further practical training (problem of justified wages as against experienced draftsmen).

. **Technical supervisory staff**
There does not really exist a level of technical supervisory staff. The available staff reached this level only by promotion and not by ability in the real sense.

. **Qualified engineers**
There are only few chartered or qualified engineers most of whom have an academic education and come from abroad.

. **Lack of status concerning maintenance personnel**
Particularly for maintenance personnel there is a certain lack of status and prestige as compared with production engineers or sales engineers. For that reason very often well trained maintenance personnel changes to production, sales or even management which obviously gives more chances for promotion and satisfaction. The result of this is a waste of effort, cost and time to train skilled maintenance personnel.

. **Lack of skill versus investment**
This general lack of skill and the scarcity of personnel able to handle new and modern equipment are some of the main reasons for

entrepreneurs not investing much for repair and maintenance. This is applicable also to modern systems as regards stock holding of spare parts.

. Lack of business administration
In the field of business administration exists a lack of skilled staff for evaluation or analysing. This is the interpretation of information that has been carefully collected. Unfavourable trends in repairs should be noted and steps taken to control problem areas; individual high cost repairs could then be traced to this cause.

. Changing requirements toward skill in respect of automation
The introduction of semi and fully automatic equipment reduces demand for higher skill for operating personnel, but accelerates or even multiplies the requirements for higher skill in supervision, maintenance and business administration. The same trend is to be expected in the number of personnel.

- Education in General
It is necessary again to draw attention to the fact that the manpower situation is overshadowed as follows:

- the possibility of raising the required number of adequately trained and subsequently skilled personnel is limited by the small population

- arrangements for the improvement of general education have only just been started

- today, therefore, there is an absolute lack at the middle supervisory level of personnel who have gained adequate basic knowledge and can apply it

- there is still a trend to emigrate to UK, USA and Canada. Only skilled personnel go abroad. The result of additional training abroad and the reaching of higher levels of skill is only partly effective as there is only a slow flow of returning emigrants.

- transfer of emoluments of emigrants contributes favourably to the balance of payments but not to the balance of manpower

- the total burden of education still falls on Jamaica which receives only part of the benefits from the same.

. the fast growing bauxite industry is a high capital intensive one. Only 5 to 10 percent of the total costs are in respect of labour. This industry, therefore, can pay the highest wages and absorbs permanently highly trained and skilled personnel. Its in-plant training scheme, on the other hand, is excellent.
This situation is inevitable and Jamaica has to live with it.

- Spare Parts Supply

. The insufficient supply of spare parts is another factor affecting the adequacy of repair and maintenance facilities adversely. To a certain extent the insufficiency arises from distortions outside the island (see pages 24 and 25). However, on the other hand, would entrepreneurs take the prevailing situation under due consideration, they had to react in such a way as to have at hand spare parts at any time at the optimum number and quality whenever required.

. This means there is a certain lack of entrepreneur's and management attitude towards this specific problem. An optimum solution would bring economic benefits and would improve already adopted repair and maintenance systems which are incomplete for the time being.

Seiegiller Industriebau
Gesellschaft m b H

- Stockholding Systems

  Generally spoken there is a lack of adequate systems for visualized cardex or even computerized systems for a reliable stockholding of spare parts (see page 26).

- Poor condition of Maintenance Equipment

  Besides the difficulties arising from manpower problems and spare parts the poor condition of maintenance equipment is of minor importance for the time being (see page 16).

- Maintenance Programming

  Maintenance Programming is still lacking somewhat (see page 29), but is to be judged of minor importance too under the prevailing situation.

- High Level of Profits

  Besides the above-mentioned statements another important factor affecting adversely repair and maintenance facilities is a general trend to achieve highest profits with no justified re-investment. This is obviously only a short time view.

(d) Effect of Absence of Standardization and unnecessary Variety of Equipment on Maintenance and Repair

- Attitude to Standardization

  The necessity for standardization of equipment which leads subsequently to lower investment in spare parts is accepted conceptionally. But due to pressure of actual requirements which often need on-the-spot decisions and purchase it seems to be mostly impossible to implement standardization of equipment under the prevailing situation. Entrepreneurs are often forced by circumstances to purchase immediately in order to keep their factories running.

- Negative Effects due to Impact of Financing Institutions

  It was claimed that lending institutions were insisting on world-wide tenders and on the purchase of cheapest offers. The result is a mix-up of equipment on which the industry had no influence or right of its own selection of standardization.

- In this connection, standardization must not necessarily be taken as the provision of the same equipment from the same manufacturer. Rather is it to imply that uniform standards should be aimed at for all industrial equipment.

  This goal, also, has not yet been reached in Jamaica.

- Change in Designs

  In this respect it was reported that the ordering of spare parts becomes more difficult sooner than expected. Suppliers change equipment and subsequently spare parts. Spare parts for older equipment are not being provided over long periods.

- ISO-Standard

  This particular problem arises from the fact that ISO-standards (International Organization for Standardization) are not at present universally adopted.

- Summary

  Improving standardization of the implementation of uniform standards and its observation would have by all means positive effects.

(e) Exist any Government Organizations or private institutions dealing with Repair and Maintenance and how effective are they?

. The Jamaica Industrial Development Corporation (JIDC) provides through its Industrial Services Department and its Productivity Centre special courses for repair and maintenance.

. The Jamaica Institute of Management (JIM) provides similar courses at the managerial level.

. Nothing is known so far about the effectiveness as all courses have started only recently.

(f) Are there any Government policies affecting repair and maintenance?

. No such policies have been detected during the survey.

4. Personnel

(a) Availability of Skilled Personnel

A number of personnel who have had or are undergoing training in repair and maintenance

- A national sense for rhythm seems to be favourable for mechanical jobs. But there is a wide spread complaint regarding the lack of skilled personnel at all levels especially in the fields of:

  mechanics and electricians
  engineers
  business administration
  managerial supervision.

  There are no reliable statistics showing the number of personnel who have had or are undergoing training in repair and maintenance. With few exceptions it was reported that the actual number of personnel specially trained is by far too low

- It was discussed whether the establishment of a roster showing such information about personnel as required by UNIDO will be useful or not.

  The arguments against establishing such a roster were as follows:

- Independent Industry
  It can be observed a strong trend and feeling for absolutely independent operation of manufacturing firms. There is a strong refusal to accept any government influence or bureaucracy.

- Reserve toward cooperation
  Furthermore there is no real feeling for cooperative methods, as a cooperative member, who is also a competitor might be able to control operations to some extent. There are, however, a few exceptions which, on the other hand, were backing strongly the idea of establishing such a roster. JIDC again could be the right local counterpart.

- The roster needs, however, special attention as the level of skill is today not a question of education certificates but the gaining experience over some years. Judgement therefore varies from company to company and gives no justified answer.

(b) Availability of Training Facilities:
Vocational training centres
in-plant training, and
programmes for training (locally and abroad)

Existing Institutes for Technical Education

- Academic

  The University of the West Indies has a Faculty of Technology in Trinidad and provides academic education.

- Colleges

  The College of Arts, Science and Technology (CAST) in Kingston has a Department of Electrical and Mechanical Technology which provides two-year courses which lead to the Ordinary National Certificate and three-year courses which lead to CAST - Diploma and Higher National Certificate.

  Courses are available for

  Mechanical Technology, and
  Electrical Technology.

- High Schools

  Six Technical High Schools spread over the island provide high school education with a bias to applied technical sciences and practical subjects.

- Training Centre

  One Trade Training Centre in Kingston provides trade and industrial courses principally at the pre-apprenticeship level.

- **Technical Institutes**
  Two Technical Institutes provide "technical education" offering pre-apprentice courses

- **Management**
  The Jamaica Institute of Management (JIM) provides courses at the managerial level.

- **Jamaica Industrial Development Corporation (JIDC)**
  The Jamaica Industrial Development Corporation provides through its Industrial Service Department and its Productivity Centre technical assistance for the purpose of implementing or improving efficient production and accounting management.
  Its sub-departments include:

  Industrial engineering
  - assistance on plant lay-out
  - production control
  - material utilization
  - quality control
  - machinery design and installation
  - and plant operation including
  - repair and maintenance

  Cost and Management Accounting
  - systems for the purpose of controlling expenditure
  - inventuries, sales and financial management

Training

programmes for training facilities and training guidance aimed at increasing supervisory and management skills and techniques.

- In-plant Training
  Various firms have their own in-plant training schemes or are just starting in order to cover their own requirements of skilled personnel.

- Efficiency
  The efficiency of all the above-mentioned institutes suffers from the low and inadequate primary school education, particularly outside Kingston. They have firstly to fill the gaps in the knowledge of basic subjects which is often quite inadequate.

- Lack of Teachers
  In addition to that problem there is a lack of qualified teachers, training staff and instructors for in-plant training schemes.

- Lack of Equipment
  The equipment for instruction purposes is often inadequate.

RECOMMENDATIONS

5. Future Policy

(a) Survey of Maintenance and Repair Needs and Establishment of Priorities

- Taking the overall situation of repair and maintenance the most crucial problem is by all means that of the scarce number of especially trained personnel and furthermore the general lack of skill on all levels of manpower.

  Besides this fact all measures and efforts to improve the situation of repair and maintenance are second- or third-ranking only.
  Very frequently it was stated in management circles that any steps towards improvement, which will end in financial allocations, will have no positive results as long as this lack of basic technological knowledge prevails. On the other hand, it had been declared frankly, that purchasing equipment and spares is not a matter of the money involved or lack of foreign exchange with a few exceptions (see para 3 c).

  Grading-up the general education level and providing an adequate basic technical knowledge will certainly improve fundamentally the situation.

The effects will be twofold:

- increase of the number of adequately trained personnel having the required skill, generally and especially for the purpose of repair and maintenance;

- possibly a positive change of the management attitude towards repair and maintenance and increase of its willingness to up-grade the respective equipment.

On the other hand, the attitude towards a reliable stockholding of spares is to be judged as unrealistic today taking into consideration the prevailing situation of deliveries.

However, a few entrepreneurs act absolutely reasonable, realizing that having a proper system of maintenance under the prevailing situation is only possible to achieve by a justified input of capital, for instance high wages which attract skilled personnel. That means, that for the large remaining number of enterprises which act otherwise the chance to get such personnel slows down and subsequently their efficiency will be lower.

Special training is necessary with regard to repair and maintenance. Additionally to vocational training, provided by national or international

agencies, in-plant training schemes have been shown to be most useful. To up-grade those schemes, which are widely adopted, bias has to be given to a special training for instructors as to strengthen the effect of such in-plant training (see recommendation under 5 (e). page 65)

After education and training, mentioned above, the general demonstration of all kinds of benefits due to the implementation of repair and maintenance programmes will certainly improve the situation by achieving a better attitude towards repair and maintenance.

Besides the demonstration, actual assistance should be rendered as follows:

- Assist firms in establishing maintenance systems which have no at all for the time being,
- assist such companies which have only incomplete systems,
- recommend such guidelines as to improve the physical condition of equipment

This includes demonstration, special courses, assistance for introduction of maintenance systems, assistance for organization, standardization and

programming problems, provision of technical information and maintenance manuals and the establishment of important rosters providing statistical information about firms engaged in certain fields, activities, equipment, stocks, personnel, etc. (see recommendation 5 (c) page 60)

The situation of repair and maintenance could certainly be improved by the introduction of supporting governmental measures with regard to repair and maintenance such as:

- provision for repair and maintenance for firms, which apply for advantages in line with the special incentive laws. This would include such guidelines as to improve the physical condition of maintenance equipment (see recommendation 5 (b) page 58)

- financial incentives for in-plant training schemes (see recommendation of 5 (e), page 65)

- financial incentives for stocking of spare parts (see recommendation 5 (d), page 62)

(b) Recommendation on the up-grading of existing facilities

Sectorwise the repair and maintenance facilities in the following sectors need special attention:

- manufacturing industry in general, except
  - Kingston Industrial Works (KIW)
  - refinery
  - tyres
  - cosmetics
  - food
  - beverages

  } only larger sized firms

- road traffic service for passengers
  road traffic service for freight

- automobile repair shops

- telephone service

- technical equipment for agricultural purposes

Taking the physical conditions of existing facilities and the conceptionally adoption of repair and maintenance systems as granted, the efficiency of the existing facilities will be up-graded by the following recommendations:

- Improvement of Education
  UNIDO should assist or join other UN organizations in their efforts to improve standards of education at all levels. (See recently approved UNDP assistance scheme for Vocational Training).

  LONG TERM PROGRAMME

- Establish a Campaign:
"Information regarding purchase and implementation of equipment according to technical and economic criteria only"

This campaign provides special courses, seminars and advice and concernes equipment in general, equipment for repair and spare parts and includes formulaes for capacity estimates. It will provide also such guidelines and information as to improve even existing repair and maintenance equipment. This campaign has to be started simultaneously with activities towards standardization.

Joint venture of
UNIDO and local counterparts such as
Jamaica Industrial Development Corporation (JIDC),
Jamaica Manufacturers Association (JMA),
Jamaica Management Institute (JMI)

SHORT TERM ACTION

- Standardization

Improve standardization with a special view to problems of repair and maintenance and up-grading

of facilities in assisting the

Scientific Research Counsel
Ministry of Finance and Planning.

This assistance seems to be necessary only for the implementation stage of standardization efforts, which effects will be seen only in the long run, but which nevertheless have to be started (see 3 (d), pages 41, 42, 43). In this connection standardization must not necessarily by taken as a provision of the same equipment of the same manufacturer. Rather it is to imply, that uniform standards should be aimed at for all industrial equipment.

Additionally to the assistance in formulating standardization regulations the training of local counterparts is to be recommended. The expert should not be assigned as to complete the standardization activities but just to start them up; The local counterparts shall continue in observing the regulations afterwards.

Joint venture of

UNIDO
Ministry of Finance and Planning

SHORT TERM ACTION

- Technical Information

Establish a "Bureau of Technical Information" which will provide

. worldwide index of potential suppliers
. statistical information
. knowledge about newly published technical methods, techniques, routines, etc. in a library which holds
  books, statistical review, periodicals, technical and economic journals

Generally there was found a lack of information as described above. Sometimes competent entrepreneurs are going abroad in order to get those information by chance. But what is lacking in Jamaica is a technical information bureau at home which is able to provide all necessary data.

Sometimes it was stated that it makes more sense going abroad being pre-informed.

Joint venture of

UNIDO

Jamaica Industrial Development Corporation (JIDC)

Jamaica Manufacturers Association (JMA)

SHORT TERM ACTION

- "Roster of Equipment"

  Establishment of a roster of used but not obsolete equipment for production and maintenance, available for other manufacturing companies in case of urgent replacement and in respect of starting standardization .

  Joint venture of

  UNIDO

  Jamaica Industrial Development Corporation (JIDC)

  Jamaica Manufacturers Association (JMA)

  SHORT TERM ACTION

- Establish a Roster showing such Statistical information as

  . Number of firms and type and volume of manufacture they are engaged in;

  . age of the firms and other pertinent information;

  . importance and impact on national economy;

  . importance in the field of export;

  . availability of repair and maintenance systems and programmes;

  . availability of in-plant training systems and

  . number of personnel employed with a breakdown whether

skilled

semi-skilled or

unskilled

and kind of special training and experience.

The information available after preparation of this roster will be one of the important fundamentals for further recommendation to up-grade existing facilities besides improvements of skill.

Joint venture of

UNIDO and

Jamaica Industrial Development Corporation (JIDC)

SHORT TERM ACTION

- Industrial Policy

Assist the Ministry of Trade and Industry in formulating and executing its industrial development policy with a special view to problems of repair and maintenance e.g. junction with incentive measures.
"No incentives without introduction of preventive maintenance".

The effects of this action will be threefold:

. Firms who apply for the granting of special advantages under the incentive laws (see page 9) should be forced to make provisions for preventive maintenance from the very beginning

Together with respective provisions in the incentive agreement, the firms should be given expert advice, where necessary, to establish such systems. This needs constant controls afterwards in order to keep the systems functioning.

- Firms who already enjoy advantages of the incentive laws should make on their side provisions for preventive maintenance if not already done. A respective assistance should be provided too.

- To propagate the idea of repair and maintenance.

Besides the assistance in formulating and executing this new industrial policy, local counterparts should be trained, who could take over the duties of the foreign expert later on.

Joint venture of

UNIDO

Ministry of Trade and Industry

Jamaica Industrial Development Corporation (JIDC)

SHORT TERM ACTION

Maintenance Manuals and Programming
Provide up-to-date maintenance manuals for specific industries which will enable those respective companies to establish preventive maintenance programmes with only short term assistance by foreign experts in each case.

In this respect mother factories or suppliers should give more emphasis on this subject (see recommendation (5 h) page 69)

Joint venture of

UNIDO

Jamaica Industrial Development Corporation (JIDC)

Jamaica Manufactures Association (JMA)

LONG TERM PROGRAMME

(c) Recommendations on the Establishment of new Facilities if necessary; central (regional or national) repair shops, in-plant of repair and maintenance facilities, the establishment of repair and maintenance programmes in the different factories.

To demonstrate all kind of benefits due to the implementation of repair and maintenance programmes and to achieve a realistic and more favourable attitude there should be established a

Central and Mobile Repair and Maintenance Workshop.

- This workshop with partly mobile equipment will act as contractor predominantly for the private sector of the manufacturing industry and will furtheron demonstrate all positive effects of maintenance.

This multi-purpose unit will provide

- performance of contracting jobs in the field of repair and maintenance
- assistance for the introduction of adequate maintenance systems including stockholding systems
- courses especially on preventive maintenance
- demonstration of repair and maintenance methods, techniques and routines
- maintenance manuals

It is understood that the workshop will charge for performing contracting jobs and will compensate as far as possible the local expenditure. Besides of having a well equipped and organized repair-shop this unit will certainly improve the whole situation as it could operate in the most industrialized region in Kingston and its outskirts.

Joint Venture of

UNIDO (4 experts)

JIDC (4 local counterparts, 6 skilled labour, local, 1 office clerk, local)

LONG TERM PROGRAMME

(d) Recommendations on improving existing Stores and the Establishment of new ones.

- Roster of Stockholding

  Establish a roster of stocks of available spare parts to introduce a

  "Cooperative System of Borrowing and Loan"

  for interchangeable parts to avoid unnecessary down-times and to assist standardization.

With regard to this recommandation, however, it has to be repeated that rhere is no real feeling for cooperative methods. There are, however, a few exceptions which together with JIDC and JMA would back the establishment of such a roster.

Joint Venture of

UNIDO

Jamaica Industrial Development Corporation (JIDC)

Jamaica Manufacturers Association (JMA)

SHORT TERM ACTION

- "Financial Incentives for Stockholding"
  Initiate additional financial incentives for excess stockholding, e.g. duty exemptions, to compensate incurred interest for additional investment. This action will avoid severe difficulties in delivery times and customs clearance and will bring economic advantages for bulk orders. Furthermore it will improve the management attitude towards a realistic consideration regarding optimal stock-holding.
  Less down-time, more production and higher profitability will compensate for the initial budget losses. Assistance should be given in formulating and executing a respective policy. This means expert advice regarding stockholding systems and constant control of such enterprises who enjoy financial advantages. Also a training of local counterparts should take place in order to replace the foreign expert as soon as possible.
  Joint Venture of
  UNIDO (1 expert)
  Ministry of Trade and Industry
  Ministry of Finance
  SHORT TERM ACTION

(e) Required Training with Establishment of Priorities; Vocational Training Centre, Short Period Classes in Factories and In-plant Training, Specific Training for Specific Machinery.

- Vocational training is provided and will be improved furtheron by a recently approved UNDP assistance scheme for vocational training.

- The Stanford Research Institute, Menlo Park, California/USA, has recently prepared a report dealing with this subject.

  "Feasibility Study of an Expansion Programme for Vocational Education in Jamaica," October 1968

  From this source the anticipated annual output of the expanded trade training programme shows 2750 graduates annually and an additional 325 carpenters and joiners bianually. (See Table 4).

- In-Plant Training Schemes
  In-plant training schemes are adopted widely or are just in stage of implementation.

  But in-plant training schemes, whether given informally or under a formal apprenticeship scheme, have well known defects. Even when organized

TABLE 4

Anticipated Annual Output of Expanded Training Programme

Training Programme	Annual Output
Auto mechanics	325
Diesel mechanics	125
Electrical installation	250
Electrical shop	175
Radio and television repair	200
Machine shop and fitting	150
Pattern making	75
Plumbing and pipefitting	250
Sheet metal work	75
Steel fabrication	75
Welding	225
Masonry	325
Shoe repair and leather work	175
Garment trades	75
Vocational agriculture	150
Hotel service trades	75
Annual total	2.750
Carpenters and joiners, biannually	325
total	3.075

Source: Stanford Research Institute

systematically they are often narrow in scope, dividing the skills and knowledges into too many sub-specializations and paying too much attention to learning tricks of the trade rather than to skill training in depth. Instructors lack pedagogical training and teaching materials are either insufficient or totally lacking. Sometimes the training period is far too long. To overcome these difficulties, UNIDO should establish a "Specialized Unit for Training of Instructors" for in-plant training.

Joint Venture of

UNIDO

Ministry of Education, and

other appropriate International Organizations

Jamaica Industrial Development Organization (JIDC)

LONG TERM PROGRAMME

- Financial Incentives for In-plant Training

Initiate additional financial incentives for establishing more in-plant training schemes, e.g. deduction of expenses before taxation, where an organized system of in-plant training can be proved. Assistance in formulating and executing a respective policy.

Joint Venture of

UNIDO (1 expert)

Ministry of Trade and Industry

Ministry of Finance

Ministry of Education

Ministry of Labour and National Insurance

SHORT TERM ACTION

- IQ - Test

  UNIDO should initiate an IQ test for all suitable candidates for technical training so as to avoid waste of educational qualifications and professional staff for tuition of unsuitable candidates.

  Joint Venture of

  UNIDO

  Ministry of Education, and

  other appropriate International Organizations

  LONG TERM PROGRAMME

(f) Recommendations on the Establishment of Spare Parts Storage Systems: in-plant store or control store

- See explanation under para 5 (b) "Industrial Policy"

  Provisions for repair and maintenance should cover also stockholding systems and the availability of spare parts.

  The Central and Mobile Repair and Maintenance Workshop (see recommendation para 5 (c)) could simultaneously provide spare part storage systems for in-plant stores if required.

- Furthermore establish a "Centralized Computer Centre for Economic Stockholding" to enable manufacturing firms to utilize the most modern system of stock supervision without having such a computer unit of its own.

  Joint Venture of

  UNIDO (1 expert)

  Jamaica Industrial Development Corporation

  IBM

  SHORT TERM ACTION

(g) Recommendation on the Establishment of Spare Parts Manufacturing Facilities with a Programme

- The establishment of spare parts manufacturing facilities in Jamaica is not to be recommended for the time being due to the following reasons:

  The Jamaican Industry is still in its first steps of development. The actual requirements of spare parts will not justify respective investment so far, as no economics of scale will be reached.

  The foreign exchange situation of Jamaica is favourable and taking the distortions in delivery times in due consideration it should be possible to have a optimal solution regarding the supply of spare parts.

  Starting the manufacture of spare parts needs high qualified personnel which is lacking in Jamaica for the time being. For that reason manufacturing of spare parts should be started at a later stage of industrial development only.

(h) Role that can be played by Developped Countries and Mother Factories

By advice of the Government the companies of the bauxite industry have not been visited. It was reported on the other hand, that repair and maintenance programmes are established on a high level and that in-plant training schemes are excellent.

The latter fact is also true for some other important factories influenced by foreign capital. Where assistance is needed mostly is the independent manufacturing sector.

Sometimes it was reported that urgently needed experts from potent suppliers were not send to Jamaica notwithstanding Jamaica clients were offering financial compensation. It was claimed that Jamaica is a market with only limited potentials. Potential suppliers obviously do no pay due attention in every case to Jamaican clients.

i) Help in the Establishment of Central Spare Part Stores:

Assistance could be rendered obviously in the field of repair and maintenance of

private cars
busses
trucks, and
earthmoving equipment

in such a way, that suppliers of equipment and spare parts should insist on using spare part storage systems which have been established already by suppliers or mother factories according to former experience.

They should furthermore insist on having optimal stocks at hand.

ii) Help or share in financing Central Repair Facilities

The equipment for the Central and Mobile Repair and Maintenance Workshop (see recommendation in para 5 (c)) could be a donation from International Assistance Organizations, from National Organizations or from potent suppliers of such type of equipment.

iii) Help in organizing Repair and Maintenance in the different Factories and in running Training Courses for particular Equipment:

Potent suppliers of equipment and/or mother factories could assign technical experts for a limited time in order to render assistance in organizing repair and maintenance programmes using particular equipment and providing maintenance manuals for special machinery.

iv) Help in establishing or perhaps in sharing in financing the Establishment of Spare Parts Manufacturing Facilities

Not to be recommended for the time being (see para 5 (g)).

v) Supply of Personnel to advice on Repair and Maintenance problems generally and in the different factories
See explanation in para 5 (h) iii).

Additionally it would be possible to make available special training courses and/or seminars in industrialized countries or in production units of mother factories.

6. SUGGESTED PROGRAMME OF IMPLEMENTATION

From the numerous recommendations put forward, it is possible to propose the following measures classified according SHORT TERM ACTION or LONG TERM PROGRAMME, to priority and expenditure:

A LONG TERM PROGRAMME

Central and Mobile Repair and Maintenance Workshop (see para 5 (c))

Technical Information (see para 5 (b))

Maintenance Manuals and Programming (see para 5 (b))

		US $
Workshops, Office and Garage		12,000
Workshop equipment		14,000
Store materials		2,000
VW Minibus		2,500
1 Special truck with winch and hoist		3,600
Equipment of Mobile Repair Unit		1,400
		35,500
Water, power, cleaning, refuse disposal	annually	1,200
Maintenance of vehicles	annually	1,800
Postage, telephone, stationery	annually	1,500
		4,500
1 Project Manager	annually	24,500
2 Maintenance engineers job performance	annually	49,000
1 Engineer for technical information and programming	annually	24,500
4 Local engineers	annually	28,800

		US $
6 Highly skilled workmen, local	annually	28,800
1 Office clerk, local	annually	2,500
1 Helper, local	annually	1,400
		159,500
Implementation of Workshop		35,500
Fixed assets	annually	4,500
Salaries and wages	annually	159,500
Library		7,200
Subtotal		206,700
10 % contingencies		20,300
	TOTAL	227,000
and for each additional year		
Fixed assets		4,500
Salaries for foreign experts only		98,000
Subtotal		102,500
10 % contingencies		10,500
	TOTAL	113,000

(Remark: Salaries and wages for local employees from revenues)

Central and Mobile Repair and Maintenance Workshop in Kingston, Jamaica

- Break-down of equipment

(i) Workshops, Office and Garage

1 Building with Office, Garage and Workshops
approx. 9 m x 18 m, approx. 5 m high = 800 m^3
1 m^3 = 15 US $ 12,000 US $

(ii) Workshop Equipment

1 hand-operated crab, 1.5 t carrying capacity	700 US $
1 small lathe, height of centres: 100 mm distance between centres: 500 mm	625 US $
1 lathe, height of centres: 250 mm distance between centres: 1000 mm	2,000 US $
1 milling machine, height of centres: 250 mm distance between centres: 1000 mm	1,500 US $
1 upright drilling machine 0 - 10 mm	100 US $
1 upright drilling machine 0 - 20 mm	250 US $
1 grinding machine 125 mm	75 US $
1 grinding machine 300 mm	125 US $
1 belt sanding machine	250 US $
1 plate shears, length of cut: 800 mm length of cut: 500 mm	300 US $
2 hand drilling machines 0 - 6 mm	75 US $
1 hand drilling machine 0 - 12 mm	60 US $
1 hardening furnace with salt and oil bath	1,000 US $
1 coil winding machine	900 US $
1 drying chamber, infra-red heating	150 US $
2 oxyacetylene welding outfits	125 US $
2 small welding transformers	250 US $
1 spot welding machine	200 US $

4 . 3 soldering irons, electrically heated	90 US $
1 small circular saw	75 US $
1 small band saw	90 US $
1 small panel planing machine	400 US $
1 joiner's bench	50 US $
1 mobile compressor for 7 kg/cm^2 gauge compressed air	450 US $
1 sheet metal roller, hand-operated	150 US $
1 tube roller, hand-operated	50 US $
1 bending press, hand-operated	200 US $
tinsmith's tools	125 US $
1 anvil with 2 horns and block	80 US $
1 forge	40 US $
4 work benches	300 US $
4 vices	50 US $
1 hot washing plant	240 US $
2 pulley blocks 500 kg	60 US $
2 " " 1000 kg	80 US $
3 oil pumps, 20 tons	90 US $
ropes, chains	300 US $
6 voltage detectors 0 - 600 V	180 US $
3 ammeters	120 US $
4 tool cabinets, containing	
various hammers,	
water pump pliers,	
pipe wrenches,	
various pliers,	
combination pliers,	
side cutting pliers,	
end cutting nippers,	
various screw drivers,	
various files,	

reamers,
pins,
punches,
twist drills,
thread-cutting tools,
scraping tools,
saws,
plate shears,
various chisels
Sawing devices up to 250 mm,
grease guns,
various spanners,
various box wrenches,
various wrenches for socket head cap screws,
various socket wrenches,
cable lamp 4 x 200 = 800 US $
various measuring instruments

12,705 US $

10 % small shop tools 1,295 US $

(iii) Store Materials 14,000 US $
2,000 US $

Mobile Workshop

(iv) 1 VW Minibus 2,500 US $

(v) 1 Special Truck with Winch and Hoist 3,600 US $

It is proposed that the vehicle should be of the station wagon type with double cabin, designed for 1,5 t useful load.

The loading surface should be covered and the cover supported by a solid superstructure.

Holding devices for the various tools could be prepared according to requirements. The installation of special tool cabinets has not proved useful. However, it must be ensured that the load will not slip out of place.

(vi) Equipment of Mobile Repair Unit

1 gripping tackle, 3 t
2 return pulleys (rope block)
1 lifting tackle, 1.5 t
1 Lukas pump, 50 t
1 Lukas pump, 20 t
2 pump boxes for Lukas pumps
1 freight handling winch, 1.5 t
1 freight handling winch, 3 t
1 hemp rope 16 dia. x 25 m lg.
4 slinging ropes 12 dia. x 1 m lg., 16 dia. x 2 m lg.
2 crow bars
4 support chocks, 100 x 100 x 500
8 wood wedges
1 drilling machine, up to 13 dia. (air-operated)
2 drilling machines, up to 10 dia. and up to 23 dia. (electrically operated)
1 transformer 220/42 V
1 cable placed on cable drum, approx. 50 m
1 drum for compressed air hoses, compl.
1 portable grinder (air-operated)
1 portable grinder (electrically operated)
1 welding transformer, 220 V, incl. accessories (small transformer)
1 oxyacetylene welding outfit, consisting of burner box gas and oxygen cylinders and hoses, approx. 25 m lg.
1 blacksmith's sledge

1 blacksmith's chisel
1 drift pin
2 spanners each of 50 - 55, 60 - 65, 70 - 75, 80 - 85
1 Gedore box 10 - 32
1 Gedore box 22 - 50
1 set of drills 3 - 23 dia.
1 set of wrenches for socket head cap screws 3 - 24
1 set of towing devices
2 clamps
1 set of measuring instruments: caliper rule, inside and outside calipers, thickness gauge
various screws, split pins, washers, lock washers
2 spatulas
1 case containing cotton waste and cleaning rags, packing material, asbestos cord, Klingerit, Epple
2 cans containing brake fluid
1 can containing HP oil
1 bucket containing grease G2h
1 can containing petrol for cleaning purposes
1 hand grease gun
2 sets of miscellaneous tools
sundry material 1,400 US $

Summary

Workshop, Office and Garage	12,000 US $
Workshop Equipment	14,000 US $
Store Materials	2,000 US $
VW Minibus	2,500 US $
1 Special Truck with Winch and Hoist	3,600 US $
Equipment of Mobile Repair Unit	1,400 US $
	35,500 US $

B SHORT TERM ACTION

Implementation of Systems of Stockholding
(see para 5 (f))

		US $
1 Expert	annually	24.500
1 Car	annually	2.000
1 Counterpart by JIDC	annually	7.200
Material, office equipment		1.500
		35.200
10 % contingencies		3.800
	TOTAL	39.000

C SHORT TERM ACTION

Formulation of Industrial Policy

i) Financial incentives for stockholding (see para 5 (d))

ii) Financial incentives for in-plant training (see para 5 (e))

iii) Industrial policy (see para 5 (b))

1 Expert	annually	24.500
1 Local counterpart by Jamaican Government	annually	7.200
Office by Jamaican Government		-
		31.700
10 % contingencies		3.300
	TOTAL	34.000

D SHORT TERM ACTION

STANDARDIZATION

- Information regarding Equipment (see para 5(b))
- Standardization (see para 5 (b))

		US $
2 Experts	annually	49.000
2 Local counterparts	annually	14.400
Office		-
Car	annually	2.000
Office equipment		1.000
Sub-total		66.400
Contingencies		3.600
	TOTAL	70.000

E SHORT TERM ACTION

ESTABLISHMENT OF STATISTICAL ROSTERS

- Roster of equipment (see para 5 (b))
- Roster of stockholding (see para 5 (d))
- Roster of statistical information (see para 5 (b))

1 Expert	annually	24.500
3 Local counterparts	annually	21.600
Car	annually	2.000
Office equipment		4.000
Subtotal		52.100
Contingencies		4.900
	TOTAL	57.000

F LONG TERM PROGRAMME

Training of Instructors for In-Plant Training
(see para 5 (e))

		US $
1 Expert	annually	24.500
2 Local counterparts	annually	14.400
Car	annually	2.000
Educational aids	annually	1.000
Sub-total		41.900
Contingencies		4.100
	TOTAL	46.000

G LONG TERM PROGRAMME

Additional Measures

i) Improving education (see para 5 (f))

ii) IQ-test (see para 5 (f))

UNIDO should assist or join other organiaztions to improve standards of education at all levels.

Expenditure for necessary meetings

approx. 10.000

ANNEX

List of Official Entities, Agencies and Commerical Firms Interviewed

A Ministries and other official entities

Ministry of Trade and Industry	Kingston
Ministry of Education	Kingston
Ministry of Agriculture and Lands	Kingston
Ministry of Labour and National Insurance	Kingston
Ministry of Finance and Planning	Kingston
Embassy of the Federal Republic of Germany	Kingston
United Nations Development Programme Jamaica	Kingston
International Labour Organisation/JIDC	Kingston
Jamaica Industrial Development Corporation	Kingston

B Public Services

Jamaica Railway Corporation	Kingston
Public Works Department	Kingston
Jamaica Public Service Co. Ltd.	Kingston
Jamaica Telephone Company Ltd.	Kingston
Jamaica Broadcasting Company	Kingston
Jamaica Omnibus Services Ltd.	Kingston

C Industrial Associations

Jamaica Manufacturers Association	Kingston
Jamaica Employers Federation	Kingston
The Sugar Manufacturers Association of Jamaica Ltd.	Kingston

D Educational Institutions

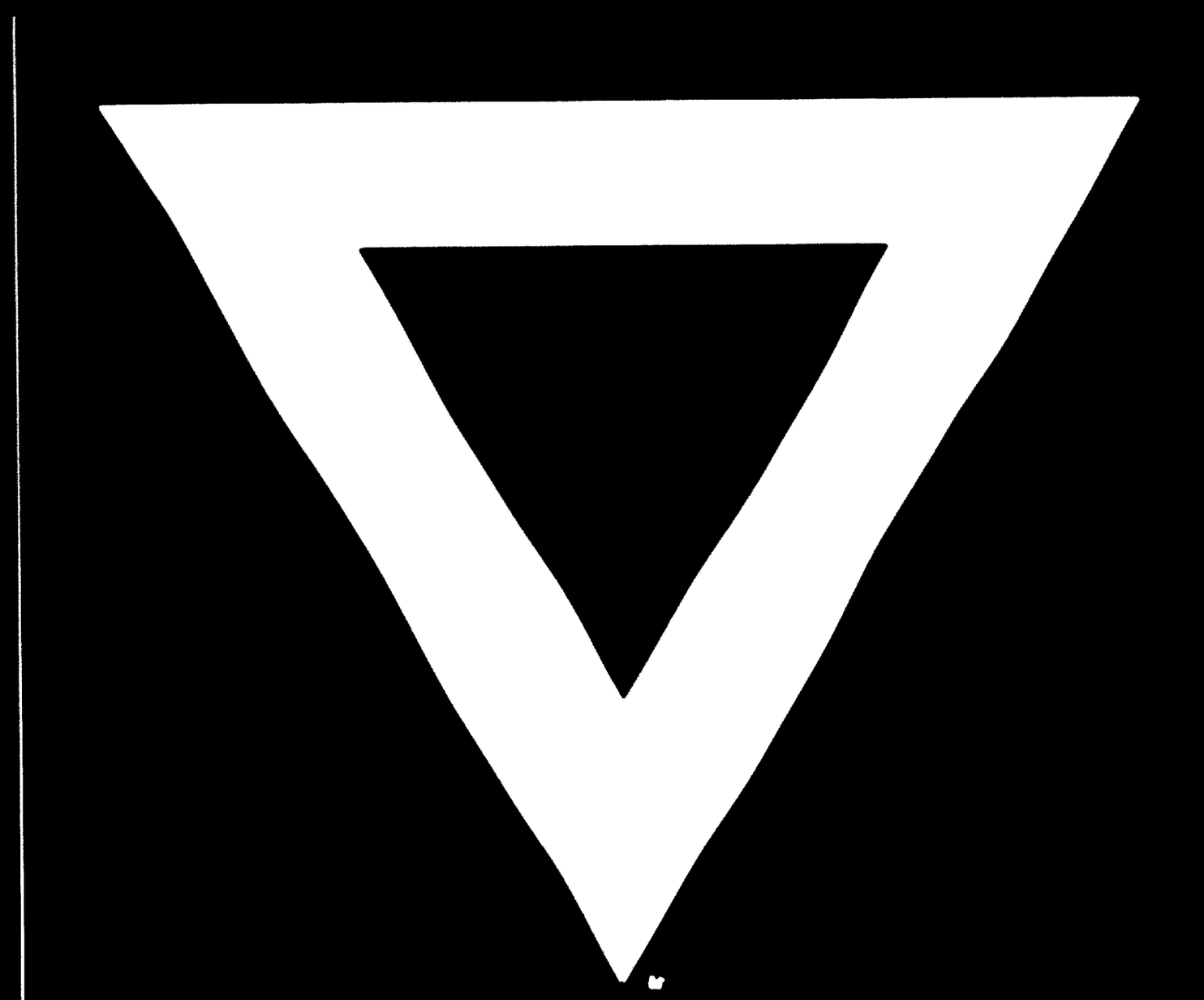
University of the West Indies, Mona	Kingston
College of Arts, Sciences and Technology	Kingston
Vere Technical High School	Vere
St. Andrew Trade Training Centre	Kingston

E Mechanical Er ring

Kingston Industrial Agency Ltd.	Kingston
Kingston Industrial Works Ltd.	Kingston
Reginald Aitken Ltd.	Kingston
Antilles Trading Co. Ltd.	Kingston
Kelly Engineering Works Ltd.	Kingston
Todd Engineering Works Ltd.	Kingston
Conditioned Air Corporation Ltd.	Kingston
Geddes Refrigeration Ltd.	Kingston
Wonards Engineering Ltd.	Kingston

F	**Electrical Engineering**	
	Bicknell and Silvery Ltd.	**Kingston**
	Bicknell Kilpatrick Ltd.	**Kingston**
	R.A. Silvera Ltd.	**Kingston**
	Armatures and Dynamics Works Ltd.	**Kingston**
	Veterans Air Conditioning Co.	**Kingston**
	Hinds Brothers Ltd.	**Kingston**
	A.L. Little Associates	**Kingston**
G	**Sugar Industry**	
	West Indies Sugar Co. Ltd.	**Kingston**
	West Indies Sugar Co. Ltd.	**Monymusk**
	Sevens Sugar Estate Ltd.	**May Penn**
H	**Metal Production**	
	Caribbean Metal Products Ltd.	**Kingston**
	Aluminium & Steel Products Ltd.	**Kingston**
	Gibson Deryck Ltd.	**Kingston**
I	**Chemical Industry**	
	Seprod Ltd.	**Kingston**
	Industrial Chemical Co. (Jamaica Ltd.)	**Kingston**

J	**Foods and Beverages Industry**	
	Desnoes & Geddes Ltd.	Kingston
	Cremo Ltd.	Kingston
K	**Cement Industry**	
	Carribean Cement Co. Ltd.	Rockfort
L	**Textiles, Clothing and Footwear**	
	Ariguanabo Co. Of Jamaica Ltd.	Spanish Town
	Bata Shoe Co. (Jamaica) Ltd.	Kingston
	Regent Manufacturing Co. Ltd.	Kingston
M	**Different Manufacturing Industries**	
	West Indies Glass Co. Ltd.	Kingston
	West Indies Paper Products Ltd.	Kingston
	Maifair Furniture Co. Ltd.	Kingston
	Federal Record Manufacturing Co. Ltd.	Kingston
	Thermoplastics Ltd.	Kingston
N	**Automobile Service Centres**	
	Sinclair's Garage Ltd.	Kingston
	Prestige Motors Ltd.	Kingston
	Automotive Spares Co. Ltd.	Kingston
	Brown's Engineering Works and Auto Parts	Kingston



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