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HUMAN RESOURCES DEVELOPMENT FOR INDUSTRIAL MAINTENANCE IN MAURITIUS

Prepared for Regional Experts Group Meeting.

Nairobi, 23-27 June 1986

by

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May 1986

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SUMMARY

MAIN FINDINGS AND RECOMMENDATIONS

1. The problems which Mauritius face in the development of human resources development are qualitatively different from those of other countries in the African Region. Universal Primary education has long since been achieved and a substantial fraction of children enter and complete secondary education.

THE MAURITIAN EDUCATION SYSTEM

2. The formal education system - which includes 6 years for primary, 5 for secondary and 2 for senior secondary - of Mauritius follows the British system in its structure and requirements for certification. Pre-primary, post secondary, vocational and non formal education are also provided.

   It must be underlined that previously, education was free for primary education only. This free education was extended in 1977, to secondary and post secondary levels as well. This has had a tremendous impact on Government's budget and the share of total education expenditure has grown to almost 15.43% in 1976/77.*

3. Government is now faced with the task of improving the relevance and quality of its training system in particular , making it responsive to a changing economic situation and to the evolving requirements for manpower qualified to contribute to national economic development. The deeply ingrained academic tradition will necessarily make this a long term process. The focus should now be on practically oriented activities and primarily on manufacturing, sugar being saturated as a source of employment. It has thus become important that development of human resources be specifically tied to job requirements, particularly those in the export-oriented industry.
However, the man power information required to guide planning of human resources development is not well developed, this task is made much more difficult given the climate of rapid economic and technical change and the uncertainties regarding what opportunities and problems the future will bring.

THE INDUSTRIAL SECTOR

4. Export oriented activity is a very recent phenomenon. Introduced in 1970,the Export Processing Act, which gives a package of incentives to manufacturers has given a new direction to industrial development in Mauritius. Prior to this date, the industrial sector was mainly dominated by sugar processing and import substitution industries, e.g oil refinery, soap manufacturing, chemical distilleries and refineries and so on. Faced with the big unemployment problem in a highly populated economy, the only recourse was the setting up of labour-intensive industries with export outlets, given the limited size of the domestic market.

5. Recent developments show that export manufacturing and services are the only promising outlets for future growth of employment in Mauritius. The share of manufacturing in GDP rose from 8%** in 1970, to 10.5 in 1979, and to almost 20% in 1986. Net employment creation which averaged 5000 annually during the 1970's, tapered off, but witnessed a new surge recently. In fact employment in EPZ which was 24,495 in Dec 1983, rose to 37,532 in Dec 1984 and to 53,440 in Dec 1985***. The annual increase, as can be seen by these figures surpassed those achieved in the early years of the establishment of the EPZ. The rate of increase averaged 14,000 per annum, for the two years, 1983-84. Exports in this sector also showed the same trend. Mauritius which has been traditionally exporting sugar which constituted in 1970 almost 90% of its exports, has now been able to diversify its exports. Sugar exports as a percentage of total exports has diminished in importance to reach 40% in 1985 whereas manufacturing exports are 46.8% ****. These figures indicate clearly that the Government's target to generate 6000 new employment opportunities in the 1984-86 Three-Year Plan , in the manufacturing sector has been met fully. This proves that the unemployment problem can be solved through the export manufacturing sector.

6. The development of the industrial sector has been more oriented towards textile manufacturing. Textile represents 80% of all EPZ exports and employment. This sector, up to now, could use the large pool of unskilled labour available in the country. The employers were able to train their factory operatives in the factories in a relatively short time span.

They had recourse to expatriate technicians for more skilled labour. It should be emphasised that the main asset of the island is its bilingual, easily adaptable and intelligent young labour force. However, there is need for higher technical skills in the workforce with the advent of more sophisticated technology. Owners and managers of the EPZ have already expressed their need for and support of such skill development.

SOURCES

\# : *Digest of Statistics - Ministry of Information*

\## : *Mauritius economic revue 81/83*

\### : *Economic indicators, Ministry of Plan, Issue no. 33*

\#### : *Economic indicators, Ministry of Plan, Issue no. 32*

ROLE OF TRAINING IN INDUSTRIAL MAINTENANCE

7. Manpower training facilities exist in both the public and private sectors. On the one hand, technical and vocational training is provided at state-run industrial trade training institutions, the University of Mauritius and handicraft centres while the three public institutions and five training institutions attached to para statal organisation provide specialised training. On the other hand, private fee charging institutions provide a wide range of training facilities and on-the-job training is provided at the entreprise's level in private establishments.

However, the problem that poses itself is whether training infrastructure network is sufficient to cater for the smooth development of all our training needs at all levels.it is clear that there is need for industrial training , given the mode of development adopted by the government, but the importance of training in other sectors of the economy should not be overlooked.

In the public sector for example, policy makers, technicians dealing with projects should be trained to update their knowledge in modern skills and technology. Certain major public projects have encountered several difficulties owing to the lack of foresight on the part of policy-makers. In the private sector, in particular, in industries, trai ning has been mostly provided at factory level. With regard to training in industrial maintenance, the problem is less acute for the private sector. Most suppliers of equipment provide for after sales service. Whereas the public sector purchases equipment through tendering procedures and overlooks including maintenance costs and training in their projects. Many equipment are lying idle or are being under-utilised because of lack of spare parts or technical know-how Problems in the existing infrastructure of Mauritius have been identified and certain measure were to be followed.

A Central Training Office, (CTO)was to be set up with the objectives to monitor the needs for occupational training, to advise on technical and vocational training, to administer, control and operate training schemes and to provide for assistance in and regulate apprenticeship on the job training programmes. However, certain constraints are impeding the establishment of such an institution as it is felt that training will be too much centralised in one organisation.

CONCLUSIONS & RECOMMENDATIONS.

9. It is felt that more attention must be given to the creation of such an institution which could act as a pilot project. Political and other consideration should not hinder its development.
I believe that the CTO could operate on a more modest scale and serve primarily as a data collection unit for all training requirements in the country.

10 The CTO would also provide a link between industry and the other sections of the economy. Policies must also be introduced for the funding of industrial training and incentives to industry to carry out systematic training. A system must be devised for tax levies to support the training programme. All parties , government and private sector should be involved in sharing the responsibility for the training.

11. Since these syllabus and certificates vary from one institution to another, standard certification should be introduced at national level. Such system which is considered to be the basis of industrial life in developed countries should give both employers and employees a common yardstick for measuring skills and so permitting free movement of workers between jobs within the country.

12. Technical subjects relative to industrial needs be included in the curricula of the secondary schools.
The specific field of industrial maintenance should be included in all training schools.

13. A national campaign of awareness on maintenance problem be launched so that nationals as a whole is made conscious of the necessity of training in this area.

14. Regional co-operation in this field can also be fostered through regular meetings or seminars.

15. Setting up of an institute of Industrial Maintenance.

16. Organisation of seminars on maintenance management for public investment projects to bring more awareness to government planners.

17. Organisation of training on integrated programme maintenance - management and cost control for manufacturing sector.

18. Fiscal facilities for supporting small industries providing maintenance and repair services.

19. Reduced rates on equipment bought for maintenance workshop and spare parts.

20. Financial assistance to the existing organisation in its efforts of organising training courses.

21. Donors be invited to provide for standardised equipment.

INTRODUCTION

COUNTRY:	Mauritius
DATE:	1985
GROSS DOMESTIC PRODUCT AT FACTOR COST:	Rs. 13,700.- US$ 1,014.-
MANUFACTURING G D P:	Rs. 2,730.- US$ 202.-
SHARE OF MANUFACTURING INDUSTRY TO G.D.P.:	19.92%
MAIN INDUSTRIAL SECTORS:	Sugar/Export Processing Zone Products (mainly textile)
MAIN EXPORTS:	Sugar, manufactured goods and other agricultural products
POPULATION:	977,500
LABOUR FORCE:	383,200 **
PERCENTAGE ADULT LITERACY:	80%
POPULATION IN PRIMARY SCHOOLS:	135,012
POPULATION IN SECONDARY GRAMMAR SCHOOLS:	70,351
POPULATION IN UNIVERSITY:	
- SCHOOL OF ADMINISTRATION	154
- SCHOOL OF AGRICULTURE	58
- SCHOOL OF INDUSTRIAL TECHNOLOGY:	122
POPULATION IN TECHNICAL COLLEGES - TERTIARY LEVEL:	497

NAME OF INDUSTRIAL TRAINING ORGANISATION/INSTITUTES:

- University of Mauritius
- Lycee Polytechnique Sir Guy Forget
- Industrial Trade Training Centre (ITTC) - Beau Bassin/Piton
- Collège Technique St. Gabriel
- Private vocational schools

** *Estimation 1986*

Source: Central Statistical Office.
Economic Indicators No. 10

OVERVIEW OF INDUSTRIAL MAINTENANCE PROBLEM

0.1 Mauritius' economy was until recently dominated by sugar production. Sugar cane occupies about 90% of cultivable land and accounted in 1970 for 90% of total exports and constituted 30% of the GDP.

0.2 The manufacturing sector was then mainly concerned with the domestic market such as food, beverages, tobacco, assembly and repairs of transport equipment.

0.3 The EPZ , offering a generous incentive scheme, was established in Dec 70, to encourage manufacturing for exports. It proved remarkably successful in attracting the foreign investors and mobilised local funds. Among the 277 industries established in EPZ, clothing and knitwear have been especially successful. Employment in this sector grew from 6% of total employment to 24% in 1985. Exports of manufactured goods which were negligible in 1970, accounted to 45.8% of total exports in 1985.

0.4 The present situation is characterised by a rapid and outstanding growth of the export manufacturing sector which have now exceeded the sugar industry in terms of employment and foreign currency earnings, as shown in the following table :

1985	EMPLOYMENT	% OF TOTAL EMPLOYMENT	EXPORTS (MILLION RUPEES)	% OF TOTAL EXPORTS
Sugar	45,022	21%	2.367	40.9
EPZ Manufactured Goods	53,500	24%	3.283	46.8

0.5 The sugar sector in Mauritius groups some 21 factories whose equipment have long surpassed its economic life. But given that these factories operate only half a year, and all the equipment are serviced regularly , the maintenance department has always been considered to be well managed and the level of equipment reliability is high. On the mechanical side, this sector has all the craft skills, mechanics and fitters. With the modernisation of the sugar factory the maintenance department has started to experience difficulties owing to a lack of trained personnel in modern technology, in particular, electronics.

0.6 The manufacturing sector can be divided into 3 main parts:

- Heavy mechanics like spinning, dyeing and weaving plants,
- Precision mechanics like watch making, jewellery and optical goods
- light mechanics like knitting and sewing, leather products, fishing tackles, furniture.In most of these plants, engineers are employed as production men and therefore accumulate the duties of a maintenance manager. Maintenance department ranks least in importance, if not inexistent in some plants.

The reason put forward is that engineers are too costly, brand new equipment do not require any maintenance and 24-hour production leaves no time for maintenance.

0.7 In plants involving heavy mechanics, maintenance management does exist. One modern spinning plant has an integrated programme of maintenance management.

In the light manufacturing sector, there is inplant training for the mechanics to set the machines, the level of maintenance organisation is very low, the mechanics work in the production team and this is considered to be a very satisfactory structure for the organisation. The different types of machines used in the textile factories are given at annex 1.

0.8 The type of maintenance applied is the breakdown maintenance which is more common. Preventive maintenance is of low application in all industries. Most of the manufacturing industries have the support either of their own workshop or outside workshop.

As far as mechanical maintenance is concerned, it seems that the requirement for skilled labour can be met, but there is a real lack of technicians for the electric and electronic fields and engineers. With the advent of new technology in the manufacturing process, the success of this sector will depend on the trained manpower available. Owners and managers of the EPZ industries have already expressed their need for and support of such skilled development.

METHODOLOGY

The methodology which guided this study was:

- Research work on the basis of documents , reviews, reports on the economy of Mauritius:
  - Mauritius Economic Review 81/82
  - 3-Year Plan - 1984 - 1986
  - The Public Sector Investment Programme - 1984/85 - 1986/87
  - Economic Indicators
  - Progress Through Productive Employment - Joint Economic Committee February 1982
- Meetings with officials of different ministries and responsible of the private sector: the Mauritius Employers Federation, Joint Economic Committee.
- Visits to spinning and knitting plants and maintenance workshops and technical colleges.
- Conduct of a survey among production managers.

1. INDUSTRIAL MAINTENANCE POLICY & STRATEGY

EDUCATIONAL SYSTEM

1.1 Mauritius has a good network of schools and education institutions Enrolment at primary level is universal while the secondary level accounts for about 60% of boys & girls. As regards to technical education, the infrastructure and facilities do exist.

1.2 The budget of education which represents 13.67% of the total budget is allocated as follows:

46.5% for primary,

34.4% for secondary

10.6% for technical and vocational and the rest for administration and school inspectorate. (See annex 2)

1.3 The formal education system of Mauritius which includes 6 years for primary, 5 for secondary and 2 for senior secondary, follows the British system in its structure and requirements for certification. Primary education covers six grades (designated Standard I to Standard VI). Entry to secondary school is contingent upon receiving the Certificate of Primary Education (CPE). Secondary education is made up of five grades of study (designated Form I to Form V) followed by two years of senior secondary (the upper and lower sections for Form VI). These levels cumulate with the School Cambridge (SC) and Higher School Cambridge Certificates (HSC) respectively.

1.4 Table 1 which presents the educational plan shows that the system encourages the acquisition of skills which would promote white collar employment, and does not encourage school leavers to go for training in the acquisition of industrial skills. There is a real need to establish an educational system matching the needs of a newly industrial country.

TECHNICAL & VOCATIONAL TRAINING

1.5 As shown in table 2, there are training facilities in both public and private sectors.

Technical and vocational training is provided at the University of Mauritius, state-run industrial trade institutions and handicraft centres while the 3 public institutions and five training institutions attached to para-statal organisations provide specialised training. Private fee-charging institutions provide a range of training facilities and job training is provided at the enterprise level in private establishments.

1.6 ITTC - PITON

Financed by the Govt of India, it continues to receive technical assistance from India for running the centre.

TABLE 1

EDUCATIONAL PLAN

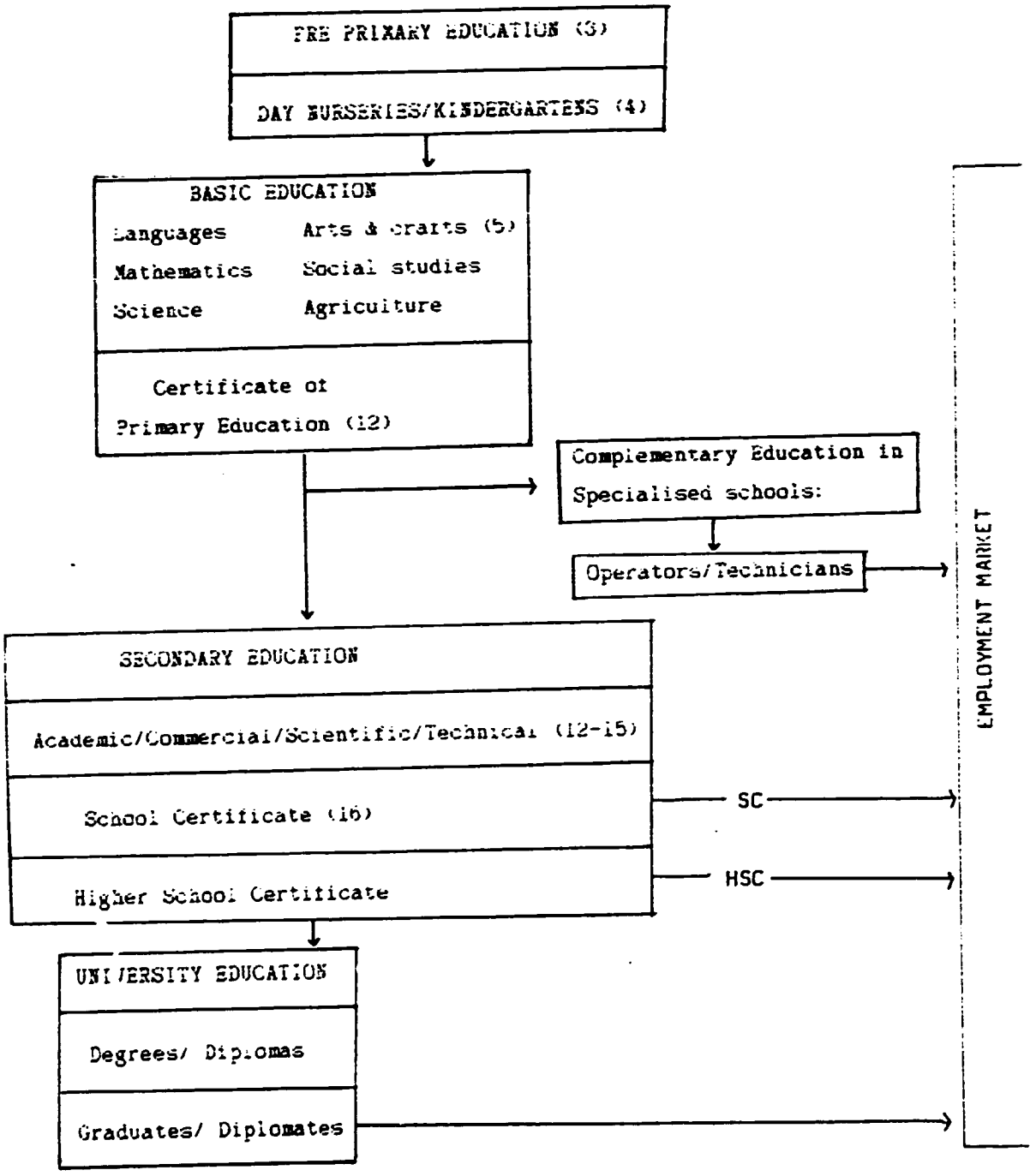


Table 2

TECHNICAL & VOCATIONAL TRAINING

INSTITUTIONS	ITTC PITON	ITTC BEAU BASSIN	LYCEE POLYTECHNIQUE	UNIVERSITY OF MAURITIUS SCHOOL OF INDUSTRIAL TECHNOLOGY	COLLEGE ST GABRIEL
YEARLY INTAKE	38	280	80I 40II		80
REQUIREMENTS FOR ADMISSION	6th Std + Entrance exam in english & Maths	Primary School Cert + Entrance Examinations	Form III Entrance exam Age limit: 16	School Certificate Higher School Cert	Form II/III
DURATION OF COURSE	45 weeks	45 weeks	3 yearsI 4 yearsII		3 years
BASIC COURSES	Maintenance fitting, Sheet metal work, tractor mechanic	Mechanical eng. Electrical Inst. Auto mechanics welding & metal fabrication plumbing & pipe fitting carpentry & joinery, masonry & concrete works	Auto mecnanics maintenance mech. electro mecnanics Masonry & concrete works II Technician for auto maintenance mechanic eng., electro tech. building, construction	Electrical mechanic	Fitting Car mechanic turning electronician
TYPE OF TRAINEES	Semi-skilled worker	semi skilled worker	I skilled worker II technician	Technician Engineer	skilled worker
CERTIFICATE DELIVERED	Exam by local board of Examiners	Trade leaving Cert, Cert by Min of Education City & Guilds of London Institute of Examinations	Brevet d'Aptitude Professionel Brevet de Techniciens	Certificate Diploma	Certificate of proficiency
REMARKS	All sponsored by employees	Provides both full time & part time courses 80% sponsored by employers Offer facilities to other institutions			All sponsored by private enterprises

1.7 ITTC - BEAU BASSIN

Set up in 1968. as an UNDP pilot project the ITTC provides courses for the training of skilled workers in the field of carpentry, electrical, wood work, metal. The training given is just sufficient to make the workers handle small repairs, and undertake light jobs pertaining to their respective fields of training. Because the majority are sponsored by employees, seats available for new job seekers are therefore limited. The centres' workshops are also used on Saturdays to trade test works of various government institutions. The ratio of instruction to training is 10 to 1.

18 THE FLACQ POLYTECHNIQUE COLLEGE

It was set up in 1982, with the French government assistance and offers up to three year courses in electric, electronic and mechanics.It is a technical college based upon the French system of technical school. It is a secondary school offering up to pre-university courses equivalent to the OND (Ordinary National Diploma) of UK and the 'Brevet de Technicien' of France.

The first batch of qualified candidates are presently being absorbed by industries.

1.9 These three public training institutions and the five government handicraft centres have a capacity to accomodate some 1100 trainees annually.

1.10 UNIVERSITY OF MAURITIUS

The school of industrial technology of the University of Mauritius is also running courses for electrical, mechanical and public health engineers, but the specific needs of industrial sector is not being satisfied, mainly on account of the general nature of the courses offered.

1.11 Public enterprises providing utility services do have a maintenance and training division headed by qualified engineers and technical personnel.

1.12 For example, in the telecommunications department, a training programme was set up to train technicians in new telecommunications systems.

1.13 The Training Centre of the Central Electricity Board, known as the 'Centre de Formation et de Perfectionnement Professionnels', was set up in 1975 to train the personnel in the electrical and mechanical fields with particular empnasis on the tradesmen grades. Since 1980, the CFPP has stopped recruiting apprentices for training instead it provides refresher courses for in-service employees.

1.14 THE ST GABRIEL TECHNICAL COLLEGE

Established in 1974, by the Roman Catholic Diocese of Port Louis, the St Gabriel Technical College provides skilled workers mainly to the sugar industry, most of the pupils are sponsored by the companies and over 250 youths have been trained during the last 10 years. The college has just open a new section in electronics to meet the requirements of the industries.

1.15 PRIVATE TRAINING INSTITUTES

There are also 160 private training institutes that provide training in a range of skills and trades such as TV and radio repairs, hotel catering, motor mechanics, computer programming. These institutions have an estimated capacity of about 2000 training places annually. The exact figures are not known as these institutions are not required to register with government or even to indicate the type and number of courses they offer.

1.16 The Apprenticeship Act, passed in 1968, makes provision for systematic training in certain designated trades. Parallel to these unsuccessful attempts at introducing formal apprenticeship, a system of informal apprentice training developed whereby employers hired school leavers at rates lower than the regular wage rates. This practice was most prevalent in trades such as tailoring, mechanical and electrical engineering.

1.17 IN SERVICE TRAINING

Employers in industry recruits only a fraction of their requirements from these institutions and rely mainly on the job training for the specific skills needed on the production line.

1.18 Among all the craftskill training provided by the different institutions, only the Lycee Polytechnique provides training linked to maintenance: 2 disciplines out of eight - that is for electromecanician & maintenance mecanics, the other training includes practical maintenance.

1.19. It is to be noted that each institution is autonomous, and that there is no link between these organised institutions to coordinate the training provided.

1.20 In March 1986, a survey was carried out by the Mauritius Employers Federation to define the manpower requirements. It is expected that with the results, there would be proposals for an educational reform, and therefore change in the skill characteristic of the new entrants to the labour market. The government has also just launched a survey for manpower planning.

LINKS

The government is fully aware that there must exist interaction between training institutes and industry and the situation is as follows

1.21 UNIVERSITY - INDUSTRY LINKAGES

In 1984, the legislation governing the activities of the University were to be amended to bring much closer and effective linkages between the University of Mauritius and industry, but unfortunately such legislation has not yet been finalised.

1.22 CENTRAL TRAINING OFFICE.

In March 1984, the CTO, Central Training Office, was created to monitor the effectiveness of training programme and the absorbtive capacity of the labour market and carry out regular follow up/tracer studies of outputs from training institutions. The C.T.O. was expected to play an important role not only in supplying skills, but also in raising the productivity of workers.

But unfortunately , the CTO, for reasons unknown, has not come into operation and the training responsibility for organising manpower was entrusted to the Ministry of Planning and Economic Development.

1.23 PRIVATE SECTOR TRAINING COUNCIL

The private sector which groups the Chamber of Commerce, employers' federation and industrial organisations, have this year set up a training council where training schemes are discussed.

A survey has been carried out on the training needs of the companies, and the training programmes will soon be proposed to government.

1.24 TECHNICAL SCHOOL - INDUSTRY LINKS

There is some existing mecanism between industry and the technical schools. The pupils of St Gabriel College are sponsored mostly by enterprises of sugar industry and the syllabus is worked out accordingly. As for the Lycee Polytechnique, there is agreement for 45-days of in-plant training during the year for the pupils and meeting with industries twice a year to discuss training programme .

Industrial works in the workshop of the college upon request of the industry are also carried out.

1.25 The present system shows that there is the infrastructure for a better organised training set-up .

AWARENESS OF INDUSTRIAL MAINTENANCE PROBLEM

1.26 Our country has embarked in the industrialisation programme only a decade and a half ago. Government planners, policy makers and the private agencies are becoming more aware of the industrial maintenance problem, particularly with different projects involving high technology, but unfortunately, the maintenance organisation and management are not taken up as an urgent matter.

1.27 In the manufacturing sector, majority of the local industries are involved in manufacture of knitwear garment thus involving light technology that requires lesser skills as regards to the maintenance and therefore does not really attract their attention.

1.28 But for management of companies making use of capital intensive techniques in production, they are actually facing enormous problems in getting the technical persons for maintenance of the existing machines. The technical manpower needs of these companies are actually being met by calling expatriate staff with relevant qualifications and experience for taking charge of these maintenance departments.

1.29 Most of these companies usually continue to keep the expatriate staff as the local institutions do not provide such types of training amd the local counterparts with job experience gained, are sometimes incapable to resume responsibility of such department after the departure of the expatriate personnel.

There are in the free zone some 1200 foreign technicians employed for a workforce of 53,000 persons.

1.30 The Development Works Corporation was instituted in 1971, to provide productive employment amongst the employed. It now employs some 4000 persons. The corporation can be considered as a maintenance service department to the nation. They were employed after being trained in different trades such as block laying, mecanics, carpentry, electricity installation, to provide services to the maintenance of all the roads, the schools' buildings etc.

1.31 The different projects, the non smooth running of equipments, in the hospitals for example have made the government planners more aware of maintenance problems in the choice of the equipment. Each department should consider the proper analysis of maintenance cost in any project as essential.

METHODOLOGY

1.32 All investments in the private sector are monitored by the Ministry of Industry through the delivery of certificates. Investors submitting their application for certificates are invited to forecast the number of employment and the skills required. The needs for maintenance personnel in industrial maintenance could be assessed from these projects.

1.33 Regular surveys of employment in the manufacturing sector are carried out quarterly by the Ministry of Industry . Improvement could be brought in the questionnaire so that personnel requirement be known.

GOVERNMENT POLICIES

1.34 Besides the existing facilities to encourage industrial training, the government has launched the **National Youth Training Programme**, a training programme for the unemployed youth who do not have the minimum entry qualifications to benefit from institutional training One way of easing their entry in productive employment is through specialised training programmes geared to skill development. The National Solidarity fund set up by the Ministry of Finances, initiated in January 1985, with the participation of the private sector, a programme to finance on the job training for unemployed youth. Since then, the National Solidarity Fund, trained 10,000 youths. Nearly 90% of the trainees have found full time employment. Their training was subsidised by the government.

1.35 To increase mauritian participation in the industrial development, the government has introduced the compulsory employment of a mauritian counterpart for each foreign technician. Besides the work permit delivered to foreign technician is accompanied with restriction such as increasing fee with the number of years.
But this law applies mainly to foreign technicians employed in the private sector and not in the public sector.

1.36 No policy has been adopted by government regarding industrial maintenance training. There is an absence of explicit training policies to match the industrial needs, the few measures taken up by government did not have the proper follow-up.

COOPERATION

1.37 With the emergence of the export processing zones which were soon found to be the key for economic growth of the country, a different approach had to be taken with regard to human resources development. The Government-Private sector meeting which are held regularly should enable the setting up of an industrial training policy.

1.38 With regard to regional co-operation in HRD in industry, no significant progress has been achieved. This is an area which could be more fully explored and suggestions made, on how to co-operate as far as development of human resources are concerned in industrial maintenance. The infrastructure for such co-operation is existent in the form of a 'Commission de l'Océan Indien' which has been set up in 1983.

1.39 Much is being done to promote co-operation in different sectors, e.g. development of a joint fishing industry.

There are two regional training centres in the public sector offering courses to participants mainly from Africa and the Indian Ocean islands. There are the regional sugar training centres for Africa providing courses in sugar technology and regional health training centres run by the Ministry of Health and providing courses in family health.

1.40 The main obstacle which may impede co-operation in industrial development of the countries concerned is that the industrial development of the countries concerned are at different levels of sophistication. It is feared that some countries may not take full advantage of the opportunities offered by such a co-operation. However, this should not prevent efforts in this direction. Already, there is a proposal to set up a centre for management training under the European Development Fund, (EDF), which could be of benefit to all the countries of the region. A seminar will be held in July to thrash out issues regarding the establishment of such a centre.

1.41 Government as has been underlined earlier, is conscious of the need to update its educational system to make it more responsive to industrial needs. Many international organisations have shown interest to help the government to achieve this objective. The World Bank has already financed a number of studies with a view to improving the infrastructure for vocational and technical studies.

The french government has assisted the govt through the provision of grant money to construct a technical school at Placq.

The government of India has also provided fund for the ITTC of Piton.

The United Nations Development Programme (UNDP) has contributed through the provision of expert services in the field of industrial training, provided scholarships to technicians.

RECOMMENDATIONS

1.42 The setting up of a link between industry and education is of utmost importance for the smooth running of national industrial training. The re-introduction of a similar body as CTO would be most welcome, so that an integrated development of industrial training is ensured. It will operate efficiently only if there is full co-operation between the private and the public sector.

1.43 Policies with regards to financing of industrial training be introduced. For example:

- *Incentives to industry to carry out systematic training*
- *Tax levies to support training programme - thus involving all parties and sharing of responsibility*
- *Incentives to individual to improve their qualifications.*

1.44 Since these syllabus and certificates vary from one institution to another, standard certification should be introduced at national level. Such system which is considered to be the basis of industrial life in developed countries would give both employers and employees a common yardstick for measuring skills and so permitting free movement of workers between jobs within the country.

1.45 Technical subjects relative to industrial needs be included in the curricula of the secondary schools.
The specific field of industrial maintenance should be included in all training schools.

1.46 Co-operation among countries through regular meetings or seminars

1.47 National campaign of awareness on maintenance problem coupled with the above-mentioned measures.

#######

2. ORGANISATION AND METHODS OF MAINTENANCE

2.1 Projects using high technology normally earmark some amount of financial resources for training of manpower before commencement of commercial production.

2.2 In the public sector, all purchases are made through tenders and some tenders now include the training of personnel for the equipment. For example, the project of the Mauritius Broadcasting Corporation colour Television - the government has earmarked financial resources for training of technician on the equipment to be set up in Mauritius In the airport project the training of technicians was included, with a line of credit of the 6 millions french francs, 260,000 francs was earmarked for training.

2.3 In the manufacturing sector, in the early stages of project, planning and implementation of industrial maintenance is not given a proper attention mainly on account of its non utility in the early stages of production - training for production retains all the attention and the equipment being brand new.

2.4 After one or two years maintenance starts taking a very important place in the production on account of occasional breakdowns causing substantial loss of production. The awareness for creation of an industrial maintenance division in the company is thus felt necessary but lack of technical staff is always a handicap in the realisation of the maintenance department creation.

ORGANISATION OF MAINTENANCE

2.5 In most instances, companies would organise maintenance under the chief engineer or the factory manager. The largest organisation would have a maintenance supervisor and a section for craft.

2.6 In the sugar sector:

Table 3 shows the organisation chart of the factory. The maintenance department is divided into two sections:
The mechanical maintenance which is under the responsibility of a maintenance engineer and electrical maintenance under an electrical engineer.

The main duty of an electrical engineer is to ensure the proper maintenance and operation of all the electrical generation and distribute equipment.He supervises a team of electricians and in the absence of an instrumentation engineer, he is also responsible for maintenance of process control instruments.
The maintenance engineer carries out the routine maintenance of the factory and implements new techniques of maintenance. He is responsible for the productivity of labour force and controls spares and supplies utilisation.
For maintenance purposes, during the intercrop, the factory is divided into departments, each under the responsibility of a shift supervisor.
The workshop includes electricians, fitters, turners, pipe fitters, welders, sheet metal workers.

Table 3

TYPICAL ORGANISATION CHART OF A MAURITIAN SUGAR FACTORY

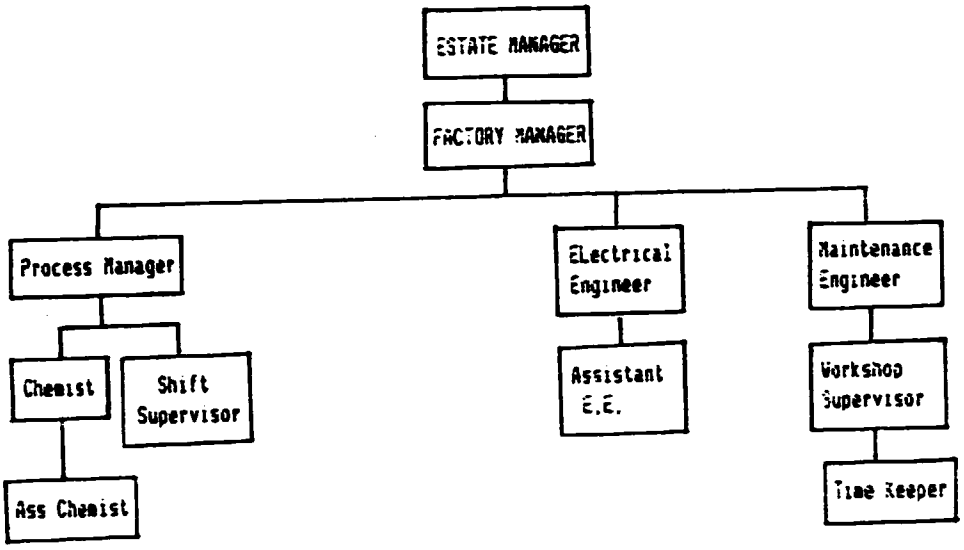
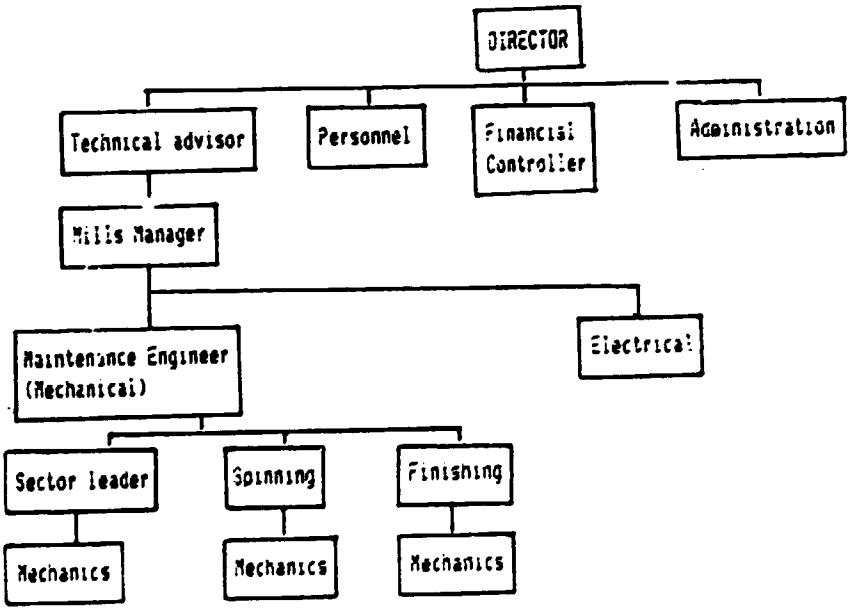


Table 4

IN A MAURITIAN SPINNING FACTORY



2.7 The Textile Sector:

In the light manufacturing enterprise, principles of work study are applied to the repetitive tasks, so that standards for methods of working, material handling aids, low cost mechanisation, linked to the application of standards times for tasks is well established. But maintenance work is not repetitive in the same way and therefore do not lend itself to systemaatic study and planning.

2.8 In a survey* carried out by the expert for the purpose of this study, in May among 30 textile companies, it was revealed that there were 3 maintenance persons to 100 workers, the maintenance personnel was higher in capital intensive plants and lesser in labour intensive enterprises. As for training of maintenance personnel, management and planning of maintenance skills came out as higher requirements to the training of craftskills but there was an element of bias in this survey because the respondents were productior personnel. They were aware of how maintenance affected production.

2.9 Maintenance ranks least of all the other kind of industrial specialisation and techniques.

To most companies, maintenance is linked to avoid emergency in breakdown of equipment,; routine maintenance is carried out but preventive maintenance which is carried out in accordance with a planned schedule is practically unknown, except for one very sophisticated spinning plant which an an integrated programme on maintenance management.

* See sample survey - Annex 3.

2.10 For the above-mentioned reasons, no statistics on breakdown, loss of production or even costs of maintenance is available.

Many textile enterprises have their own workshop and employ 3 to 5 persons to undertake small repairs.

CONSULTANCY AGENCIES

2.11 Maintenance consulting contracts are being provided by some local firms to industries. Given the high competition among the suppliers of sewing and knitting machines, the suppliers furnish not only basic instructions needed to operate the machines, but also after sales service.

2.12 We have witnessed a new phenomenon regarding the agencies held by small companies . They are being removed, the suppliers are giving representation only to companies capable to provide for technical assistance to the clients. Factories setting up tend to purchase machines whose agencies are held in Mauritius. For some equipments in the printing business, the supplier send their maintenance crew on regular basis. But it should be noted that many companies buy second hand machines and repairing break downs is common.

2.13 In the mechanical field, there are three workshops which employ some 200 persons, have 10 qualified engineers and 35 technical staff.

Forges Tardieu set up in 1820 , has served above all the sugar industry.

Its main activities are steel fabrication, foundry work, design of sugar plant, and equipment and manufacture of joints and seals.

2.14 There are three companies providing for electrical and electronic services, and employing about 150 persons. They have trained technicians in the electrical field, but they face a real lack of trained technicians for electronics equipment. When factories face severe breakdowns the parts are sent abroad for repairs. Industrial Control Equipment Ltd. is one of the three companies specialised in industrial electronics and automation. They can provide service for most of the control systems used in plants, including microprocessors based systems.

SMALL SCALE INDUSTRIES

2.15 Some companies have started utilising the services of small scale entrepreneurs providing maintenance and repair services but lack of incentives and demands for services normally handicap the small firms to expand and provide a variety of services to companies. It must be added that small workshops are not geared to make precision parts, metallurgy skills are non existent.

2.16 The in-service training for personnel in industrial maintenance is being carried out in all companies by recourse to expatriate staff. Some companies do send their technician on training course in some polytechnics or factories of the supplier of equipment to be trained.

2.17 With the advent of new technology and the constant raising of levels of technology complexity in textile industries, there is simultaneously a need for more high qualified specialists and for more widely qualified generalists to deal with the new generation of machines, and

processes now coming into use. The advertisement for trained personnel in the papers everyday, shows how acute is the problem. Newly set industries do not hesitate to 'poach' personnel from other industries.

2.18 The maintenance and repair of modules is requiring an increasingly wide knowledge of a range of technologies including not only mechnical but also electrical hydraulic, pneumatic knowledge to deal with this structural maintenance. Workers need to have a wide range of skills and special training.

2.19 The manufacturers' organisation has been organising training courses for cadres in production management with the collaboration of a recognised institute of production and courses on management and planning will be organised very soon.

RECOMMENDATIONS

2.20 Seminars on the maintenance management in the public investment project should be organised to bring more awareness to government planners.

2.21 Training on integrated programme maintenance - management and cost control for manufacturing sector be organised.

2.22 Fiscal facilities for supporting small industries providing maintenance and repair services.

2.23 Reduced rates on equipment bought for maintenance workshop.

2.24 Assist financially the existing organisation in its efforts of organising training courses.

3. TECHNICAL DOCUMENTATION OF MAINTENANCE

The Manufacturing Sector

3.1 All suppliers of plant and machinery normally provide instructions manuals on installation, fault diagnosis, maintenance procedures including maintenance plan for preventive/continuous maintenance and repairs. These documents are of extreme importance to the technical staff in the execution of their duties in the maintenance department in the highly capital intensive plant. Unless there is proper trained technicians to understand the manual and carry out the planned/preventive maintenance, the manual instruction may be underutilised.

3.2 The maintenance division in the automobile sector and the sector with heavy mechanics is also properly documented with the codification and classification of all plant and machinery, spare parts etc of each department or section within the enterprise to facilitate the task in ordering of spare parts or replacement of plant and machinery as and when required.

3.3 In the survey, mentioned before...

80% of the respondents said that they had preventive maintenance systems.

75% had schedules for repetitive tasks on their machines.

52% issue work tickets for maintenance.

37.5% employ setter for automatic machines.

The rate of utilisation of equipment is between 85 - 90%. It seems that preventive maintenance is understood as routine maintenance - denoting work which is carried out at some raiseable future occasion, whereas preventive maintenance is carried out in accordance with a planned schedule.

3.4. In service training does exist for engineers and technicians in some enterprises. The engineers are sent to the suppliers' plant for training.

RECOMMENDATIONS

3.5 Setting up of training courses on codification management and technical documentation.

****

4 SPARE PARTS MANAGEMENT

4.1 In the light manufacturing industry, the maintenance department usually keeps a minimum level of spare parts stock depending on the frequency of breakdowns and parts utilisation. It is worthwhile keeping a minimum of three month's stock of essential spare parts because of the long delivery time, but usually the average company has a stock of spare parts equivalent to 5% of total equipment, or practises 'cannibalism',i.e., take parts of a machine to fix in another machine.

4.2 It is a standard practice in all purchase contracts of plant and machinery that spare parts are supplied. Some companies often do guarantee the availability of some parts for a certain period of time because of new technologies.
For government contracts, it is usually ensured that spare parts cost which amount to 20% of the equipment, be included in the cost, but very often, the spare parts are not the relevant parts.

4.3 The spare parts should be in the stores properly designated and stock levels coded in order to facilitate issuance and storage. But the high cost of spare parts, as they are ordered from overseas suppliers , make it prohibitive for a company to stock spare parts when bank interest rate is as high as 17% - 20%.
For EPZ companies, which benefit duty free facilities for their equipment, importation of spare parts which are not on customs scheduled list entail problems.

4.4 In the event of unavailability of spare parts, local companies usually modify the installation system of the equipment or sometimes have recourse to expatriate technicians for replacement of the spare parts or order specially moulded ones for the purpose.
The remoteness of the island has also contributed to a certain solidarity among the manufacturers who will help in lending spare parts for a certain period - time of order and delivery.

4.5 Companies using highly sophisticated machinery sometimes manufacture small spare parts in their own workshop division equipped with the necessary machinery for the execution of minor jobs. Some small entrepreneurs specialise in undertaking spare parts moulding on contract basis.
The number of such small scale workshops is limited in Mauritius, as pointed before, due to a lack of incentives and on account of the low demand for jobs being entertained from local companies.
This is expected to increase significantly with the growing demand of a sector in full expansion, particularly if such supporting industries are prompt to provide such a service to large enterprises following proper package of incentives.
The high cost of equipment to manufacture the spare parts is also a disincentive for small workshops to set up.

4.6 In the EPZ sector, there is a trend for companies with high technology to set up a unit manufacturing spare parts to meet their needs with the result that a multiplication of small workshops may lead to an under-utilisation of these workshops.

4.7 In the preparation of the budget plan, provision is always made for the likely cost of repairs and maintenance to be incurred by the company. The foreign exchange for importation of spare parts is not a problem today, all export enterprises are entitled to have foreign currency account.

4.8 The man power training in spare parts management is not being carried out in industrial companies on account of the small number of spare parts involved. However, companies involved in supply of heavy machinery, vehicles etc, usually keep a large number of spare parts stocks and the man power training is normally being provided by the suppliers of the machinery themselves.

RECOMMENDATIONS

4.9 Fiscal incentives like those granted to EPZ industries for supporting industries.

4.10 Special departments at customs for importation of spare parts.

4.11 Reduced customs tariffs on spare parts.

****

5. NEGOTIATION AND ACQUISITION OF PLANT

5.1 These duties are normally provided by the Project Design and Management organisation, or by Factory Manager's plant. They would obtain quotation, technical specification and delivery of potential suppliers.

5.2 MANUFACTURING SECTOR

The industrialists usually visits overseas fairs to select their equipment or seek advice from companies which are already making use of these machines. It is to be noted that Mauritius is organising an exhibition of suppliers of textile and clothing machinery in June this year, to enable manufacturers to select their equipment, and have a better insight.

5.3 There is little standardisation of plant, because the investors setting up industries in Mauritius come from different parts of the world, and introduce their own technology and know how.

5.4 Maintenance training on new plant are provided by suppliers, only if the cost of training is included in the cost of the equipment. But all plant purchase contracts are usually provided with clauses related to after sales service and sometimes provision of technical assistance. The continuity of supply of spare parts and adequate provision in training of man power are also sometimes taken into consideration.

5.5 PUBLIC SECTOR

Training of personnel involved in pre-investment studies and preparation of tender documents should be provided. The contract of a Hydro Electric Plant, at Champagne which was not negotiated properly is a clear example of how lack of training in the above field can give rise to serious problems. The Hydro Champagne project which was supposed to cost Government 360 million rupees is now estimated at 547 million rupees.

RECOMMENDATIONS

5.6 Training in laws of contract and negotiation techniques particularly at government level should be a priority.

#######

6. TRAINING POLICY FOR MAINTENANCE

6.1 A manpower requirement survey has been carried out in March by the Mauritius Employers Federation and Annex 4 shows the results.

6.2 As for the manufacturing sector, requirement of manpower is at production level which is very relevant. See Annex 5.

With industries involving new technology, skilled and trained manpower at both maintenance management and craftsmen levels is required and a coordinated system of training programme should be developed. The results of this survey which are being worked out will no doubt give the proper parameters for a national industrial training programme.

6.3 Most of industrial maintenance training are being carried out by the companies. With the recent training seminars organised by the Mauritius Export Processing Zones Association (MEPZA), in co-operation with the Institute of Production Control, United Kingdom, it is expected that some training programme for industrial maintenance will be introduced.

6.4 There exists a private organisation which has designed practical courses for management supervisors and staff, and the courses which are well received and attended are providing training sessions to all the mauritian business community.

6.5 Discussions for mounting a course in textile technology at the University of Mauritius are under way. There were also recommendations for the setting up of a 'NATIONAL INSTITUTE OF MANAGEMENT' to provide training in areas like marketing, production and operations management, personnel and accountance/financial management.

6.6 Because of advances in maintenance planning, scheduling, and cost control, which includes computer technology, group training will have to be encouraged. Training at enterprise level is too costly if one consider that the no of persons needed to develop and initiate effective preventive maintenance programme.

6.7 The Lycee Polytechnique is presently providing for training for industrial maintenance and training programme for mecanics specialised in textile industrial machines, technicians in electrical maintenance can be set up. These two projects which are of low investment can be implemented within the Lycee Polytechnique's building.
A long term project would be the establishment of the Institute of Industrial Maintenance .

6.8 Government budget for financing HDK in industrial maintenance does not exist as such, but with the development of the Central Training Office, the system for tax levies will have to be devised.
The World Bank has been the major agency providing assistance to the educational section. Technical assistance and training in various fields have also been made available by France, U.K., U.S.A. and Egypt.

RECOMMENDATIONS

6.9 *The donors should be invited to provide for standardised equipment and all projects should include training of local personnel.*

6.10 *The two projects of the Lycee Polytechnique to introduce industrial maintenance programme to be implemented.*

6.11 *An institute for industrial maintenance be set up.*

****

ANNEXES

1. Machinery pool and types of machines

2. Government Education Budget

3. Sample of survey

4. Manpower requirements in all sectors

5. Manpower requirements in EPZ

MACHINERY POOL: SUGGESTED CLASSIFICATION

C. SPINNING

C.1. Wool Spinning:

C.1.1. Opening and blending machines.
C.1.2. Fibre dyeing machines.
C.1.3. Carding machines.
C.1.4.a. Ring spinning machines.
C.1.4.b. Mule spinning machines.
C.1.5. Twisting machines.
C.1.5.a. Winding machines - hank
C.1.6.b. Winding machines - cone
C.1.7. Yarn setting machines.
C.1.8.a. Yarn dyeing machines - High pressure
C.1.8.b. Yarn dyeing machines - Normal pressure
C.1.9. Others

C.2. ACRYLIC SPINNING

C.2.1. Stapler machines
C.2.2. Drafting machines
C.2.3. Roving machines
C.2.4. Ring spinning machines
C.2.5.a. Winding machines - Hank
C.2.5.b. Winding machines - cone
C.2.6. Twisting doubling machines
C.2.7. Others

MACHINERY POOL: SUGGESTED CLASSIFICATION

D. DYEING

D.1.1.a. Yarn dyeing machines - High pressure

D.1.1.b. Yarn dyeing machines - Normal pressure

D.1.2.a. Piece dyeing machines - High pressure

D.1.2.b. Piece dyeing machines - Normal pressure

D.1.3.a. Rope dyeing machines - High pressure

D.1.3.b. Rope dyeing machines - Normal pressure

D.2. Hydro extractor machine

D.3. Calendering machines

D.5. Setting machines

D.6. Boilers

D.7. Compressers

D.8. Others

MACHINERY POOL: SUGGESTED CLASSIFICATION

E. WEAVING

E.1. Warpers

E.2. Sizer

E.3. Tying machines.

E.4.a. Looms - Dobby

E.4.b. Looms - Jacquard.

E.4.c. Looms - Tappet.

E.5.a. Winding machines - cone-

E.5.b. Winding machines - pirn.

E.6. Others

MACHINERY POOL:

SUGGESTED CLASSIFICATION:

A. KNITTING SECTOR (PULLOVERS).

A.1.a. Hand-driven V-bed flat knitting machines - plain (classic)
A.1.b. Hand-driven V-bed flat knitting machines - jacquard
A.1.c. Hand-driven V-bed flat knitting machines - intarsia

A.2.a. Automatic flat knitting machines - plain (classic)
A.2.b. Automatic flat knitting machines - intarsia
A.2.c. Automatic flat knitting machines - jacquard

A.3.a. Computerized flat knitting machines - plain (classic)
A.3.b. Computerized flat knitting machines - intarsia
A.3.c. Computerized flat knitting machines - jacquard

A.4. Linking (or looping) machines

A.5.a. Seaming machines
A.5.b. Button holing machines
A.5.c. Button sewing machines

A.6.a. Yarn dyeing machine
A.6.b. Piece dyeing machine
A.6.c. Hydro extractor
A.6.d. Washing machine

A.7.a. Drying machines
A.7.b. Pressing machines or steam ironing machines

A.8. Boilers

A.9. Compressors

A.10. Other machines (collar knitting machines, cup seaming machines

MACHINERY POOL: SUGGESTED CLASSIFICATION

B. T-SHIRTS AND SWEAT SHIRTS

B.1. DIRECTLY PRODUCTIVE MACHINES

B.1.a Circular knitting machines
B.1.b.1: Sewing machines - single needles - auto-control
B.1.b.2: Sewing machines - single needles - manual-control
B.1.c.1: Sewing machines - double needles - auto-control
B.1.c.2: Sewing machines - double needles - manual-control
B.1.d.1: Sewing machines - three needles - auto-control
B.1.d.2: Sewing machines - three needles - manual-control

B.2. DIRECTLY PRODUCTIVE MACHINES OF SPECIALISED TYPES

B.2.a Cuff knitting machines
B.2.b.1. Overlock machines - auto-control
B.2.b.2. Overlock machines - manual-control
B.2.c.1. Hemming machines - auto-control
B.2.c.2. Hemming machines - manual-control
B.2.d. Collarette cutting (attaching auto-control machines)
B.2.e.1. Bartetracking machines - automatic
B.2.e.2. Bartetracking machines - manual
B.2.f. Pocket forming and buttons holing machines
B.2.g. Others

B.3. NON-DIRECTLY PRODUCTIVE MACHINES

B.3.a. Cutting machines, fusing machines.
B.3.b.1. Yarn dyeing machines - High pressure
B.3.b.2. Yarn dyeing machines - Normal pressure
B.3.b.3. Piece dyeing machines - High pressure
B.3.b.4. Piece dyeing machines - Normal pressure
B.3.b.5. Rope dyeing machines - High pressure
B.3.b.6. Rope dyeing machine - Normal pressure

B.3.c. Drying dro-extracting) machines.
B.3.d. Washing es.
B.3.e. Calendering machines.
B.3.f. Pressing machines.

F. SHIRTS, BLOUSES, AND THE LIKE.

F.1. DIRECTLY PRODUCTIVE MACHINES

F.1.a.1. Sewing machines - single needles - auto-control
F.1.a.2. Sewing machines - single needles - manual
F.1.b.1. Sewing machines - double needles - auto-control
F.1.b.2. Sewing machines - double needles - manual
F.1.c.1. Sewing machines - three needles - auto-control
F.1.c.2. Sewing machines - three needles - manual

F.2. DIRECTLY PRODUCTIVE MACHINES OF SPECIALISED TYPES

F.2.1.a. Overlock machines - auto-control
F.2.1.b. Overlock machines - manual
F.2.2.a. Hemming machines - auto-control
F.2.2.b. Hemming machines - manual
F.2.3. Pocket forming and buttons holing machines.
F.2.4. Cuff forming machines
F.2.5. Drilling machines
F.2.6. Others

F.3. NON-DIRECTLY PRODUCTIVE MACHINES

F.3.1. Cutting, fusing machines
F.3.2. Pressing machines
F.3.3. Washing and drying machines.
F.3.4. Boilers
F.3.5.a. Cloth laying machines - manual
F.3.5.b. Cloth laying machines - automatic
F.3.6. Compressers
F.3.7. Others

MAURITIUS

GOVERNMENT EDUCATION BUDGET, 1976/77 - 1982/83
(Rupees millions)

Category	1976/77 Amount	%	1978/79 Amount	%	1980/81 Amount	%	1981/82 Amount	%	1982/83 Amount	%
Ministry of Education	30,614	15.7	30,220	10.0	44,931	11.3	50,860	11.2	54,487	10.7
Primary Schools	97,026	49.9	132,176	43.9	167,866	42.4	196,484	43.3	236,000	46.5
Secondary - State Schools and JSS	16,578	8.5	27,189	9.0	38,138	9.6	45,661	10.1	47,000	9.3
Secondary - Private	26,828	13.8	77,972	26.0	105,786	26.7	118,000	26.0	126,775	25.0
University of Mauritius	11,463	5.9	14,377	4.8	15,125	3.8	15,900	3.5	15,425	3.0
Mauritius Institute of Education	6,492	3.4	9,100	3.0	11,000	2.8	11,800	2.6	12,700	2.5
Mahatma Gandhi Institute	3,964	2.0	7,501	2.5	10,173	2.6	11,009	2.4	11,500	2.3
Industrial Trade Training Centers	1,000	0.5	1,397	0.5	2,223	0.6	3,190	0.7	3,762	0.6
Handicraft Training Centers	579	0.3	813	0.3	733	0.2	796	0.2	851	0.2
Total Education Budget	194,544	100.0	300,745	100.0	395,975	100.0	453,700	100.0	508,000	100.0
Total Government Budget	1,260,978	-	1,769,965	-	2,525,190	-	3,088,339	-	3,716,048	-
Percent to Education	15.43%	-	16.99%	-	15.68%	-	14.69%	-	13.67%	-

Source: Ministry of Education, Digest of Statistics.

Annex 2

SAMPLE

Annex 3

[illegible]

GENERAL QUESTIONS

1) How many direct people do you employ _____ (Use approximate figures if exact one are not known)

3)How many maintenance people (mechanics, electricians, electronics, building) ____

3)Do you use preventive/planned maintenance systems? (Yes/No)

4)Do you have schedules for repetitive maintenance on your machines? (Yes/No)

5)Do you issue work tickets for each maintenance [illegible] (Yes/No)

Do you employ setters for automatic machines? (Yes/No)

HOW RELEVANT IS MAINTENANCE [illegible] IN YOUR FACTORY

	can train own people	need training	what need
Sewing machines			
Felling machines			
Overlock machines			
Hemming machines			
Hand flat knitting			
Automatic flat knitting			
Computerised flat knitting			
Button machines			
Wool Equipment			
Opening and blending			
Dyeing (fibre)			
Carding			
Spinning			
Winding			
Dyeing (yarn)			

Acrylic spinning

Stapler

Drafting

Rover

Spinning

Winding

Twisting

Boilers

Compressors

3) TRAINING OF MAINTENANCE PEOPLE

What is relevant to your company:

	Not Needed	Any Need	Vital
Maintenance organisation skills			
Planned maintenance			
Basic mechanical skills			
Basic electrical skills			
Basic electronic skills			
Energy			
Pneumatrics technical			
Use of instrumentation	YES/NO		
Microelectronics	YES/NO		
Computer basics	YES/NO		
Steam technology	YES/NO		

WHAT COURSES DO YOU REQUIRE ?

Textile Technology (wool)

Industrial Engineering

Materials Management

Distribution and Marketing

Quality Control

Production Planning and Control

Personnel Management

Maintaining Engineering

Improving Company Performance

Computers

Any Other

Annex 4

MANPOWER REQUIREMENTS IN ALL SECTORS

OCCUPATION	FEB-DEC 86 M	F	TOTAL	JAN-DEC 87 M	F	TOTAL
AGRICULTURE	545	322	867	443	253	696
MSPA	304	244	548	267	191	458
Other Agriculture	241	88	329	176	62	238
MANUFACTURING (Including Electricity & Gas)	581	127	708	646	39	685
EXPORT PROCESSING ZONE	1742	2177	3919	2661	2268	4929
WHOLESALE & RETAIL TRADE	64	37	101	97	25	122
HOTELS & RESTAURANTS	63	21	84	71	21	92
TRANSPORT, STORAGE & COMMUNICATIONS	633	41	674	320	8	348
BANKS, INSURANCE & OTHER FINANCIAL INSTITUTIONS	185	50	235	143	28	171
SOCIAL & PERSONAL SERVICES	212	18	230	22	64	86
ALL INDUSTRIAL GROUPS	4025	2793	6818	4403	2706	7109

Annex 5

MANPOWER REQUIREMENTS IN EXPORT PROCESSING ZONES

OCCUPATION	JAN. 86		FEB-DEC. 86		'87	
	M	F	M	F	M	F
Director/General Manager	22	2	1			
Asst. Manager/Department Manager	37	17			13	
Production Manager/Officer/Assistant	23	11	3		1	
Accountant	11	4				
Secretary		10				4
Clerks/Cashiers/Typists	64	398	5	17	7	11
Other Administrative Workers	49	102		9	37	14
Storekeeper/TimeKeeper & Assistants	51	2	1	1	2	
Supervisor	163	193	6	7	47	9
Foreman	33	141	5	5	5	5
Technician,Engineer, Maintenance Officer	106	7	3		5	5
Mechanic, Fitter, Electrician	169		16		42	
Winder		115		5		12
Knitter	364	2459	28	33	12	79
Packer	13	476	3	30	3	28
Loopers, Pressers, Menders, etc	137	2109	50	333	56	331
Factory Worker/Operator/Machinist	1408	2517	295	234	408	142
Unskilled Worker	203	34	32	5	36	4
Other Factory Workers						
Trainees	288	629				
Watchman/Security Guard	61	7	5		9	
Cleaner, Helper, Attendant, Gardener, etc	87	114	3	1	16	3
Driver	45		5		17	
Total	3334	9341	461	576	704	650
	12675		1037		1354	

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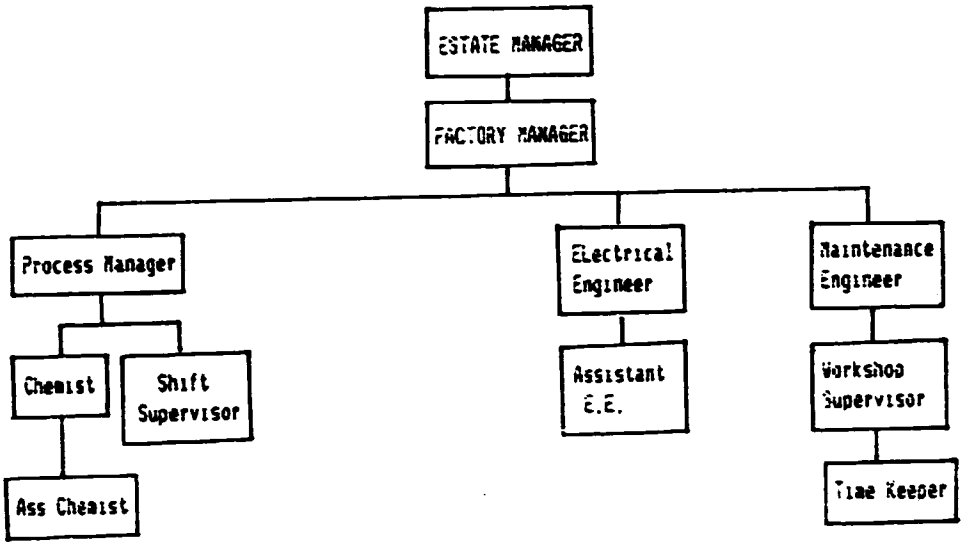

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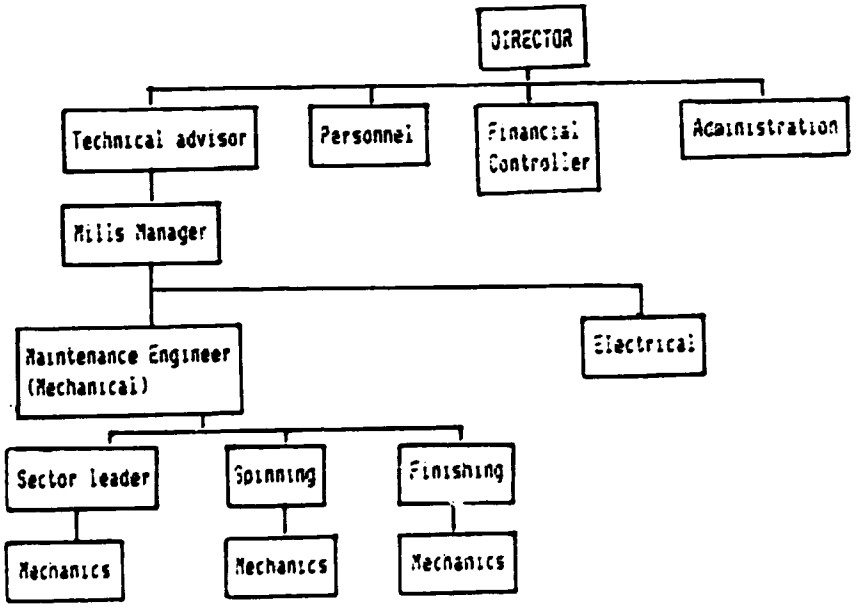

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CONSULTANCY AGENCIES

2.11 Maintenance consulting contracts are being provided by some local firms to industries. Given the high competition among the suppliers of sewing and knitting machines, the suppliers furnish not only basic instructions needed to operate the machines, but also after sales service.

2.12 We have witnessed a new phenomenon regarding the agencies held by small companies . They are being removed, the suppliers are giving representation only to companies capable to provide for technical assistance to the clients. Factories setting up tend to purchase machines whose agencies are held in Mauritius. For some equipments in the printing business, the supplier send their maintenance crew on regular basis. But it should be noted that many companies buy second hand machines and repairing break downs is common.

2.13 In the mechanical field, there are three workshops which employ some 200 persons, have 10 qualified engineers and 35 technical staff.

Forges Tardieu set up in 1820 , has served above all the sugar industry.

Its main activities are steel fabrication, foundry work, design of sugar plant, and equipment and manufacture of joints and seals.

2.14 There are three companies providing for electrical and electronic services, and employing about 150 persons. They have trained technicians in the electrical field, but they face a real lack of trained technicians for electronics equipment. When factories face severe breakdowns the parts are sent abroad for repairs. Industrial Control Equipment Ltd. is one of the three companies specialised in industrial electronics and automation. They can provide service for most of the control systems used in plants, including microprocessors based systems.

SMALL SCALE INDUSTRIES

2.15 Some companies have started utilising the services of small scale entrepreneurs providing maintenance and repair services but lack of incentives and demands for services normally handicap the small firms to expand and provide a variety of services to companies. It must be added that small workshops are not geared to make precision parts, metallurgy skills are non existent.

2.16 The in-service training for personnel in industrial maintenance is being carried out in all companies by recourse to expatriate staff. Some companies do send their technician on training course in some polytechnics or factories of the supplier of equipment to be trained.

2.17 With the advent of new tecanology and the constant raising of levels of technology complexity in textile industries, there is simultaneously a need for more high qualified specialists and for more widely qualified generalists to deal with the new generation of machines, and

processes now coming into use. The advertisement for trained personnel in the papers everyday, shows how acute is the problem. Newly set industries do not hesitate to 'poach' personnel from other industries.

2.18 The maintenance and repair of modules is requiring an increasingly wide knowledge of a range of technologies including not only mechnical but also electrical hydraulic, pneumatic knowledge to deal with this structural maintenance. Workers need to have a wide range of skills and special training.

2.19 The manufacturers' organisation has been organising training courses for cadres in production management with the collaboration of a recognised institute of production and courses on management and planning will be organised very soon.

RECOMMENDATIONS

2.20 Seminars on the maintenance management in the public investment project should be organised to bring more awareness to government planners.

2.21 Training on integrated programme maintenance - management and cost control for manufacturing sector be organised.

2.22 Fiscal facilities for supporting small industries providing maintenance and repair services.

2.23 Reduced rates on equipment bought for maintenance workshop.

2.24 Assist financially the existing organisation in its efforts of organising training courses.

3. TECHNICAL DOCUMENTATION OF MAINTENANCE

The Manufacturing Sector

3.1 All suppliers of plant and machinery normally provide instructions manuals on installation, fault diagnosis, maintenance procedures including maintenance plan for preventive/continuous maintenance and repairs. These documents are of extreme importance to the technical staff in the execution of their duties in the maintenance department in the highly capital intensive plant. Unless there is proper trained technicians to understand the manual and carry out the planned/preventive maintenance, the manual instruction may be underutilised.

3.2 The maintenance division in the automobile sector and the sector with heavy mechanics is also properly documented with the codification and classification of all plant and machinery, spare parts etc of each department or section within the enterprise to facilitate the task in ordering of spare parts or replacement of plant and machinery as and when required.

3.3 In the survey, mentioned before, [illegible]

80% of the respondents said that they had preventive/maintenance systems.

75% had schedules for repetitive tasks on their machines.

52% issue work tickets for maintenance.

37.5% employ setter for automatic machines.

The rate of utilisation of equipment is between 85 - 90%. It seems that preventive maintenance is understood as routine maintenance - denoting work which is carried out at some suitable future occasion, whereas preventive maintenance is carried out in accordance with a planned schedule.

3.4. In service training does exist for engineers and technicians in some enterprises. The engineers are sent to the suppliers' plant for training.

RECOMMENDATIONS

3.5 Setting up of training courses on codification management and technical documentation.

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