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ASSISTANCE IN THE FIELD OF PRODUCTION MANAGEMENT IN THE CMT (CUT, MAKE AND TRIM) ENTERPRISES OF THE EXPORT PROCESSING ZONE (EPZ)

SI/MAR/90/801

MAURITIUS

Technical report : Up-grading of the garment making industry for exports *

Prepared for the Government of Mauritius
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

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Vienna

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* This document has not been edited

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CONTENTS

1. ACKNOWLEDGEMENTS

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The thirty garment manufacturing organisations are to be thanked for their co-operation in making all the necessary information available in order to evaluate present and future requirements for the industry at large.

2. INTRODUCTION

Background and Information

The need for enhancing productivity in the garment manufacturing industry became apparent in 1987 as the export zone (EPZ) was shaken by a tapering off of growth and closures of several firms, mostly CMT operators of small scale size.

In an endeavour to assist and salvage some of the sick CMT enterprises, the Ministry of Industry had designed a rescue plan (1987) in collaboration with the Mauritius Export Development and Investment Authority (MEDIA) on a pilot basis, involving eleven (11) enterprises. With the help of MEDIA this newly floated export service company (ESC) of the group would secure export orders which would then be executed by the group of enterprises.

The Project

The concept of the project was:

a) To assist the ESC in installing a sound production management structure for medium scale enterprises.

b) To design guidelines in the operation of quality improvements and new production methods.

c) To train the production personnel of the ESC.

UNIDO was then asked to provide assistance; a monitoring unit subsequently provided a plan in July 1987 and, after an official request by the Government of Mauritius (26/01/89), UNIDO made a budget available in March 1989.

The time-delay due to the system of "Expert Selection" was further complicated by the Gulf war and it took 2 and a half years after the official request to have an expert on location. This vast delay had its consequences:

- A pilot unit of three (3) small-scale manufacturers had been set-up with the purpose of combining forces to handle large scale export orders. The project failed after a 6-month period, due to lack of support in the production engineering area, quality control area, and most of all, due to inability to provide proper management.

- Of the 100 CMT enterprises which provided employment to about 3,500 persons, less than 60 CMT enterprises are left. A high percentage of the 60 remaining are in financial difficulties and suffer from high labour turnovers, as they cannot provide security of employment.

- A number of small-scale factories visited only worked 2 or 3 days per week. These factories had to accept any type of work to make ends meet. A situation most unsatisfactory, in view of efficiency and quality output.

- A number of manufacturers are being exploited by "Foreign Companies" to produce goods against extremely low monetary value.

The Government of Mauritius is well aware of the situation and the "White Paper":

MAURITIUS AT CROSSROADS, The Industrial Challenges Ahead,

is a publication with the aim to set the platform for healthy debates on issues that touch practically every Mauritian quite closely.

Since this paper was established two (2) years ago, the Government is in the process of:

- Engaging people from Singapore to set-up a productivity centre (Council) duplicating the (Singaporean) format, which is a success.

- The small industry development organisation (SIDO) will undergo a major overhaul in order to make it a more practical organisation.

- Specialists have been brought in aide advise and/or lecture on topics such as Informatics and Jewellery Manufacturing, while others have evaluated the development of training institutions such as OZ (Industrial and Vocational Training Board).

The actions are too limited and there has been no development to improve the plight of the small-scale manufacturers, nor has the downward trend been reversed in the Export Production Zone (EPZ).

The answer to the question, "Is it possible that Mauritius could loose all its apparent strength and advantages brought about by the textile and garment manufacturing industry?", is a positive YES.

Mauritius is at the Crossroads stage

Mauritius is no longer the country during the last ten (10) years which has been extremely successful with an export-driven economy utilising favourable investment incentives together with an abundance of low-wages labour.

The forces of competition between nations is now the predominant factor and under these circumstances, it is necessary to re-evaluate the Mauritian position in terms of assistance required to meet the challenges ahead.

3. PROJECTION OF REQUIREMENTS FOR THE INDUSTRY

After examining thirty (30) manufacturing and/or textile places, among them small, medium and large scale organisations, the general indications are that to lift all or part of the industry into a second *success story* similar to that of the EPZ, a new and radical approach is needed.

- Total quality management principles must be applied to obtain HIGH QUALITY GARMENT PRODUCTION STANDARDS. Having established these standards the way is clear to obtain higher valued production items in the semi-fashionable category or designer-label fashions in order to respond to present market requirements within the EEC.

- Manufacturing efficiencies must be fully developed to reach the level of "High Task Performance", a level of output common in europe and in u.s.a. At this level Mauritius will stay abreast of the competition coming from countries with lower to much lower wages costs than Mauritius.

- Modern management techniques must form part of present-day manufacturing. By a specialisation of the many functions of modern management on to a group of technical assistants, a brief period of 3 - 4 weeks of "in-house" training will produce fast results.

- Once the above points have become well established within the organisation, the foundation is laid for the successful introduction of hi-tech equipment to aid quality of manufacturing.

If the general opinion prevails that cheap labour and cheap materials are the only criteria of continued success, Mauritius will lose 75% of its garment manufacturing industry within five (5) years. Countries like Indonesia and Thailand will have become the new *Miracle Wonders* of this decade.

To further emphasize the need for instant action, the following general criteria were observed:

3.1 The textile industry has achieved a high standard of quality output which has been made possible through extensive plant investments. Most of the spinning, weaving, knitting and Dye-House plants visited are very modern and highly productive. However, labour content in this industry is low, as the one operator can look after and service half a dozen or more machines and many processes are fully computerised. Certainly, being the first step of the manufacturing process, this is very pleasing to observe.

3.2. Except, from one garment factory the garment make-up factories contrast starkly with the primary textile factories; the overall efficiency in the cutting, sewing and finishing departments is no more than 35% of that found in Europe, Australia and New Zealand.

3.3. The lack of trained management is partly responsible for the uncompetitive standards found. Most of the factory management occupied themselves by moving work from operator to operator or trying to trace parts of orders "lost" in the manufacturing process, in order to complete orders for immediate despatch.

3.4 Not one factory had applied production engineering practices, a function vital to present-day survival.

3.5 Quality of a finished garment could only be measured against a sample but often written modifications would accompany the sample. Written quality specifications for each operation were not available anywhere. Thus products work IN-THE-LINE could not be measured against a "Standard" in order to make a positive decision to ACCEPT or REJECT produced work.

Checking quality at the and of the manufacturing process has always been a disaster.

3.6 In most cases, capital expenditure on equipment, plant modifications and the like will be limited but this is not overly important as the

DOUBLING OF OUTPUT

will be obtained by reorganising manufacturing systems, making better use of machines and labour available. The 2 examples below illustrate this.

4. THE TWO EXPERIMENTAL SET-UPS

4.1 Cofersen Limited

Seldom has had a reorganisation a humbler beginning. A simple wire between two poles, 20 meters apart, formed a transport mode between operations. This production line covering 14 machinists and 2 clip/examine operators produced more than 1000 polo-shirts in a 9-hour day. This production was 20% less than what the total output of the factory had been, employing 140 workers. The work flow resembled that of a synchro-flow system often with only one of two garments stock piled between operators.

Through production engineering and an active quality control procedure not only did the operators produce a remarkable quantity of units, the quality had never been better and the finished product needed only a touch-up with an iron after folding whereas before the whole garment had to be ironed (back, front and sleeves) before folding and packaging could take place.

The objective of the full reorganisation programme is to produce 5100 polo-shirts per day with the 140 operators as against the averaged daily production of 1200 units/day.

4.2 SINOTEX (Mauritius) LIMITED

The proposed railsystem as "the mode" of transport (of suspended trousers between operations will change the ratio of handling time and machining from 88% and 12% respectively to a ratio of 75% handling and 25% machining; more than doubling the operators output.

The large volume of additional capacity at no extra labour involvement will produce a financial gain of some US$ 5,000 per day for the company.

Methods engineering and work station developments will be the two other contributors along with the material handling system between operations, to produce theses exceptional results.

In terms of efficiency, the production department only reached 35% of efficiency against an international standard time taking into consideration the equipment available in the factory.

5. RECOMMENDATIONS FOR THE FUTURE

From our observations in a large number of manufacturing enterprises and the analysis of written documentation available on manufacturing in Mauritius, past and present, the ups and downs in this industry are similar to those experiences in many parts of the world in the past. However, Mauritius still provides the "Golden Opportunity" through a determined and dedicated Government and a policy to match, the low-wage structure as well as the "Reputation" of Mauritian exports to be of high quality.

To meet the challenges of the near future, the action to be taken should be:

1. Upgrade the efficiency of manufacturing to international standards.

2. Improve the all important task of managing an organization, utilising modern management techniques.

3. Establish "Pilot Units" in the four (4) corners of Mauritius to serve as tteaching units on matters of production engineering. These centres will be used also to conduct seminars and may act temporarily as productivity centres. They could later on be incorporated in the future productivity centre which is being by Government.

4. "In-House" training of technical assistants to share th task of managing/monitoring production.

5. To provide exciting opportunities for hundreds of graduates coming from institutions like the University of Mauritius, IVTB and private training establishments.

6. APPENDIX I

Follow-up on Programme

Having discussed the broad outlines of the "Project Evaluation" with the Ministry of Industry and Industrial Technology, the Ministry recommended to the consultant engineer to start two reorganisation programmes on the basis of a self-employed export with no costs to UNIDO or the Government of Mauritius.

During the time that the reorganisation programmes take place (from mid-February to end of July 1992), the Government of Mauritius will forward to UNIDO, Vienna, an official request. 1.) for assistance in industrial expertise and 2.) to re-instate the SIS Programme for Mauritius to develop and obtain export assistance for the productivity centre. The Ministry of Industry and Industrial Technology through the Ministry of Economic Planning and Development will specify the terms of reference of assistance for the expert and determine the scope of SIS assistance so that in the broadest scale possible, garment manufacturing in Mauritius will be developed rapidly to meet competition from other countries square-on.

The two reorganised factories will become "temporary" PRODUCTIVITY CENTRES so that other manufacturers at first hand will learn that through:

Trained Management

Production Engineering

Material Handling, and

Quality Control

Production can be doubled at no extra labour cost.

In co-operation with UNIDO, the Government will closely define future training requirements for this industry so that the various education institutions and their respective programmes will be coordinated and interphase to promote opportunities of employment in the garment manufacturing industry at all levels.

To address the problem of the small-scale manufacturing enterprises, a meeting will be held between UNIDO, UNDP and the Ministry of Industry and Industrial Technology to develop a plan which will put the proposed PRODUCTIVITY CENTRE CONCEPT into a capacity whereby HI-TECH technology, such as a computerised cutting room project, can become feasible. This project will not only serve the small-scale manufacturing enterprises but also forms the training ground for future technicians for the industry.

7. APPENDIX 11

Reorganising Garment Manufacturing

in Mauritius (Report No. 2)

November 1991

CONTENTS

1. INTRODUCTION

Mauritius is no longer the only place during the last 10 years which has been extremely successful with an export-driven economy, utilising favourable investment incentives together with an abundance of low-waged labour. The world is shrinking fast; distances which once formed barriers no longer exist - the world has become one enormous marketplace. The forces of competition between nations is now the predominant factor and under these circumstances it is necessary to re-evaluate the Mauritian position in terms of assistance to promote:

- **High Quality Production**
- **Efficiency at International Standards**
- **Modern Management Techniques**

There is no better time than the present to upgrade the efficiency of manufacturing and to improve the all important task of managing an organisation effectively.

Through organisations such as the University of Mauritius, SIDO, IVTB and private training institutions, qualified personnel will become available in years to come but this does not solve the immediate shortage of expertise required to sustain this industry over the next few years of extreme upheaval and competitive jockeying. Moreover, newly trained people will have a much better chance when the garment and textile industries have been expertly re-organised to the highest possible standards under present conditions. Ample scope to move into the hi-tech area in due course will create opportunities for the graduates.

The textile industry has achieved a high standard of quality output which has been made possible through extensive plant investments. Most of the spinning, weaving, knitting and dye-house plants visisted are very modern and highly productive. However, labour content in this industry is low as the one operator can look after and service half dozen or more machines and many processes are fully computerised. Certainly, being the first step of the manufacturing process, this is very pleasing to observe. The garment make-up factories contrast starkly with the textile houses; apart from the one garment factory, the overall efficiency in the cutting, sewing and finishing departments is no more than 1\3 of that found in Europe, Australia and New Zealand. Furthermore, the good quality of garments produced is not obtained on a "First Time Around" basis. The rate of rejection during manufacturing and at final inspection is much too high, pointing to faulty quality control procedures. Quite often no quality specifications are available at all so that quality will suffer even further under pressures of delivery "Dead Lines".

CONCLUSION

The recommendations and projections made in the manufacturing reports are based on detailed analysis of the present methods employed. The equipment used and\or available plus observations in regards to bundle handling, work presentation and work station engineering. The findings are then compared to reorganisation results of programs carried out by our organisation in the past.

Our specialisation in the needle-trade industry is of particular importance; each program has to be **Tailor-Made** to cope with the many variants in the industry as well as to set the perimeters for future expansions.

In most cases capital expenditure on equipment, plant modifications and the like will be very limited. The **Doubling of Output,** will be obtained by reorganising manufacturing systems by making better use of machines and labour available.

Training Management in modern management techniques and restoring the supervisors role to what it should be will create a sound footing for continued progress.

The co-ordination of the various initiatives taken by the Government and private sector; the training schemes instituted and the establishment of a Productivity Centre for the industry, will place Mauritius at the forefront of the African region.

For many companies the management techniques to be employed will be similar. The **NEW IMAGE REPORT** forms the basis of the reorganisation and simply stated the objective will be:

PRODUCING MORE WITH LESS EFFORT

The commercial advantages obtained through the reorganisation will be detailed per client under the heading:

The Reorganisation Program and Projected Savings (Chapter 10)

2. THE NEW IMAGE

Spreading and cutting form not only the first operations of the manufacturing process, they both must be executed to the highest level of quality possible in order to produce garments efficiently and with profit.

Quality and a general lack of know-how throughout the company, have been the causes of the company's low-level output efficiency.

There is no point on dwelling "What has happened in the past"; a complete overhaul is needed and to that purpose a number of **Action Stages** will be proposed so that a gradual turn-a-round will take place towards the company"s - **New Image** - The action stages to provide the "New Image" are:

2.1 Quality control and procedures with critical quality standards in written form (Chapter 3).

2.2 Work planning and programming (Chapter 4).

2.3 Production engineering covering methods and work station developments (Chapter 5).
2.4 Material handling with particular reference to work presentation and work flow (Chapter 6).
2.5 Good housekeeping practices (Chapter 7).
2.6 Management training including the training of specialised technical assistants to aid production (Chapter 8).
2.7 An operator training and multi-skilling program to enhance individual earnings (Chapter 9).

The action stages can be general and are not designed for a particular department and\or section of the manufacturing process; some stages will run parallel in sections while others must be executed and working before the next step can be taken.

The program can only become successful with full support of every person in the organisation and through special personal efforts of those placed in charge.

3. QUALITY CONTROL & PROCEDURES

Quality control refers to the task of checking produced work against a pattern or written standard. To obtain a guaranteed high level of quality output, the controls start right at the beginning of the manufacturing process;

- cloth checking to shade, width and No of faults identified by the supplier
- tension free spreading and cutting to specific instructions and tolerances to be allowed
- visual examples as well as written quality standards for operations such as fusing, sewing and finishing operations.

Quality has to become a **LIVING EXPERIENCE**, it concerns everybody and everybody is expected to contribute.

Quality procedure refers to the actual checking of the work at any stage of manufacturing. The checking procedure is referred to as the **RANDOM SAMPLING TECHNIQUE**. At any given time and place, the quality controller takes a **sample badge** of 5 units and checks these units.

- Where no faults are detected, the sample quantity is a accepted to represent the quality of the work up to that stage to be in accordance to the physical or written specifications.
- If <u>one</u> (1) deviation is found, a second sample badge of 5 units is checked.

With no further faults found the total badge is accepted to represent good quality however, if another faulty unit is found, the total quantity will be rejected. A one hundred per cent (100%) check has to follow and immediately **ACTION** is required to correct the cause of the defects.

- If one or more deviations are found in the original sample lot immediate rejection follows with a 100% check and action to correct the cause of the defects.

Random checkings may be increased or reduced depending on the individual's performance and quality record which must be kept up to date with every check taken.

At the start each operator is checked at least 5 times per day. Each checking time will be only 2-3 minutes per operator. **Action** is to be executed by the supervisor, operator trainer in conjection with the **Quality Control Supervisor** (= in charge of quality control checkers).

4. WORK PLANNING & PROGRAMMING

Labour wastage comes in many forms; at time in the form of indirect or unproductive elements.

4.1 Operations of fabric trimming, shaping, marking and\or pre-folding in preparation for the next operation.

4.2 Thread clipping and examining at the end of the line or section resulting in.

4.3 Defects established too late so that extensive repair work has to be carried out.

4.4 Complete unnecessary operations as a result of faulty machine set-ups or adjustments while other forms produce wastage through:

4.5 Underutilisation of operator potentials.

4.6 Too high a level of handling resulting in low machining percentages of total operation time.

Each area represents a study in itself, however, through actual examples, a general procedure of production planning and programming will be given to serve as a guide to optimise labour. The following steps are required -

- ESTABLISH A SPECIFICATION SHEET
  Showing a logical sequence of operations, specify type of machine to be used, attachments and most important the time per operation.
- PREPARE THE WORK LOADING SCHEDULE
  How many operators will be involved, what production potential in units and the work load factor per operator.
- WRITE UP THE WORK LOADING PROGRAM
  Provide each operator with his/her program strip including time values.
- LAY-OUT OF MACHINES

ENGINEER WGG

DATE July 91

CLIENT

STYLE Polo- Shirt

SPECIFICATION SHEET

PRODUCT DESCRIPTION

SAMPLE SPECIMEN

OPER. No.	OPERATION DESCRIPTION	MACH. TYPE	ATTACHMENT		SAM 1900CX
	PREPARATION				
	O/L Neaten Sleeve Hems		Venturi-cut		.35
	Pocket Hem (1)				.15
	Hem Sleeves		Folder/puller		.35
	Pre-fold Pocket Sides	Fusing Press	Template/paper		.25
	Set Pocket				.50
	Fuse Front Facings (2)	Fusing Press			.30
	Set Facings to Front				.80
					2.70 min
	ASSEMBLY				
	Close Shoulders	 OR	Venturi-cut		.45
			Vacu-Trim- Flat Plate		
	Set Rib Collar + Binding to Neck		Folder		.90
	Fold Top of Facings Over & Close Corners				.40
	Turn & Point Out				.25
	Fold Facing Sides under & Topstitch			1	.20
	Top Stitch Neck Binding + Set Label				.20
	Set Label to Neck + Size Tab		TOTAL TIME 14.70 MIN		.30
	Align Front Facings & Tack Across				
	Topstitch LH Facing & Form Box Motive			1	.40
	Finish Motive				
	Set Sleeves	 OR			.70
	Topstitch Sleeve Seams		Special Foot		.80
	Close Sleeve & Side Seams Suspend at Collar/Neck	 OR	Latch Back Device		.90
	O/L Neaten Hem				.40
	Fold & Sew Hem		Puller		.50
	Button Hole 3				.30
	Button Sew 3				.30
	Clip & Examine Do Up Buttons				.95
	Fold Shirt on Board		Folding Table		.80
	Bag & Seal		Bagging Set Up		.35
	Record Production				.15
	Iron Shirt				.75
					12.00

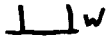
WORKLOADING SCHEDULE

A	Product Description		Polo Shirt
B	Standard Allowed Minutes (SAM)		14.70
C	No of Operators to be used		5
D	Group Efficiency (from Records or Estimated)		$\frac{85}{100}$
E	40 Hr-Week to Minutes per Day		480
F	Total Minutes Available	C x E x D	2040
G	Production Potential (in units)	$F \div B$	137
H	Work Load Factor (Min.)	$E \times D \div G$	3.00

Machine Symbols

 - Lockstitch

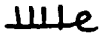
 - 2-NDL L/Stitch

 -- 2-NDL Wide Gauge

 - 3 Thr Overlock

 - 5 Thr Overlock

 - Chainstitch

 - 4-NDL Chainstitch (Bander/Elasticator)

 - 2 NDL Coverstitch

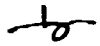
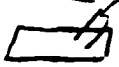
 - Blindstitch

 - Button Hole

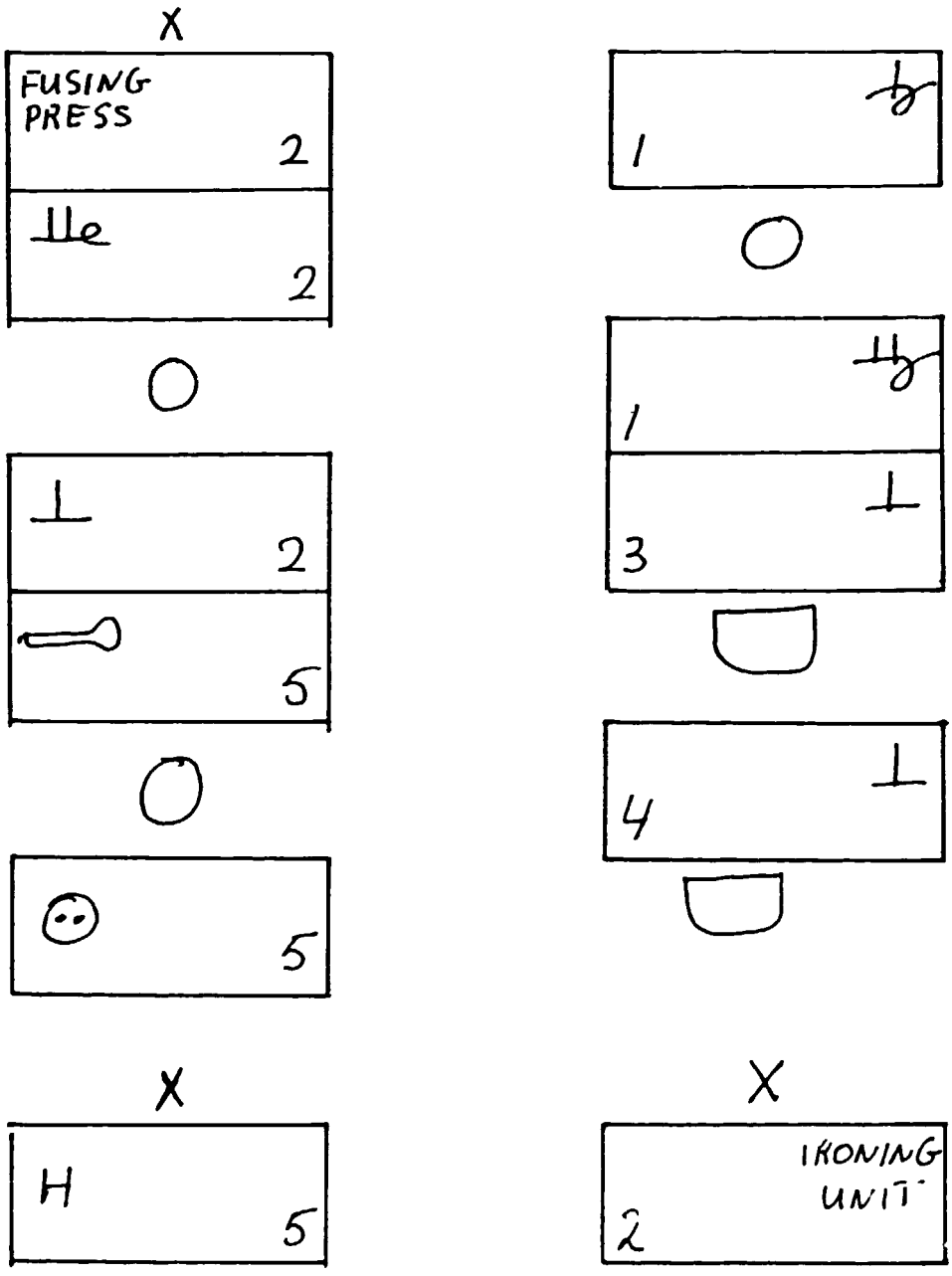
 - Button Sew

 - HAND OPERATION

WORKLOADING PROGRAM

Operator	Mach. Type	Operation Description	Sam	Total Load
1		Overlock Neaten Sleeves	.35	29.5
		" " Pocket	.15	
		Close Shoulders	.45	
		Set Sleeves	.70	
		Close Sleeve & Sides	.90	
		Overlock Neaten Hem	.40	
2	Fusing Press	Pre-fold Pocket Sides	.25	2.90
		Fuse Front Facings	.30	
		Set Facings to Front	.80	
		Topstitch Sleeve Seams	.80	
		Iron Shirt	.75	
3		Hem Sleeves	.35	2.90
		Set Pocket	.50	
		Set Rib Collar + Binding	.90	
		Fold Top of Facings over Close Corners	.40	
		Turn and Point Out	.25	
		Fold and Sew Hem	.50	
4		Fold Facing Sides under and Topstitch	1.20	3.10
		Topstitch Neck Binding, Label and Size Tab Set	.20 .30	
		Align Front Facings, Top-stitch Form Box Motive and Finish	1.40	
5		Button Hole + Button Sew	.60	2.85
		Clip + Examine, Do up Buttons	.95	
		Fold, Bag & Seal	1.15	
		Record Production	.15	

NOTE: Setting up a line with only a few operators and many different types of operations and/or machines is not an easy task as workloading on the surface looks disorientated. However a proper lay-out of the machines can help a lot to overcome 'time-wastage' of operators due to machine-changes in order to perform the varied parts of the assembly. (11 workstations but only 5 operators)



5. PRODUCTION ENGINEERING

This chapter will deal in particular with methods; the efficiency with which an operator can "Pick-up" parts to start her\his machining cycle as well as the ease of disposal (cheapest disposal = drop disposal). Production engineering should result in increased machining time against a reduction in handling\preparation time. The importance of the above is illustrated in the following table:

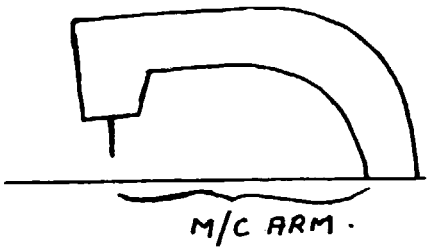
STATUS OF FACTORY	RATIO OF TOTAL TIME	
	HANDLING	MACHINING
A. Poorly Organised (Aver)	92%	*8%
B. Averaged Factory (Aver)	88%	12%
C. Reorganised Production (Aver)	75%	*25%

*The difference in production output between factory C and A is more than Triple.

Some rules of production engineering:

- Do not use the lefthand side of the machine-table as a storage place or a place to lay-out to work to start the operation.
- Eliminate pick-ups on lefthand side and disposal of sewn work on the righthand side of the operator's body (or vice versa).
- Present the work to the operator to that 'Blind" pick-ups of parts can take place, followed at the end of the sewing cycle by a 'Drop' disposal.

- As little as possible of the work should be placed under the 'arm' of the machine. The bulk of the garment should be to the left of the needle.



- Suspend work whenever possible.
- Before making methods modifications, time the existing method and evaluate the effort. Do the same with the changed method. The difference must cover the costs involved within a period of 12 months.
- Promote routine motions.
- Place parts to be attached in proximity of the point of placement to reduce the need for positioning with 2 hands.
- Utilise attachments as much as possible in order to 'De-Skill' the work as well as to promote a <u>standard quality output.</u>
- A machinist is engaged to sew, not to perform manual tasks such as: bundling ..
  Having to unfold work to start and to fold the work after sewing in order to produce a neat and tidy bundle for the next operator.
- A machinist is not a mechanic but must look after the machine if it wants to produce 'income' for the operator. A clean, a brush and a bit of oil daily.

6. MATERIAL HANDLING

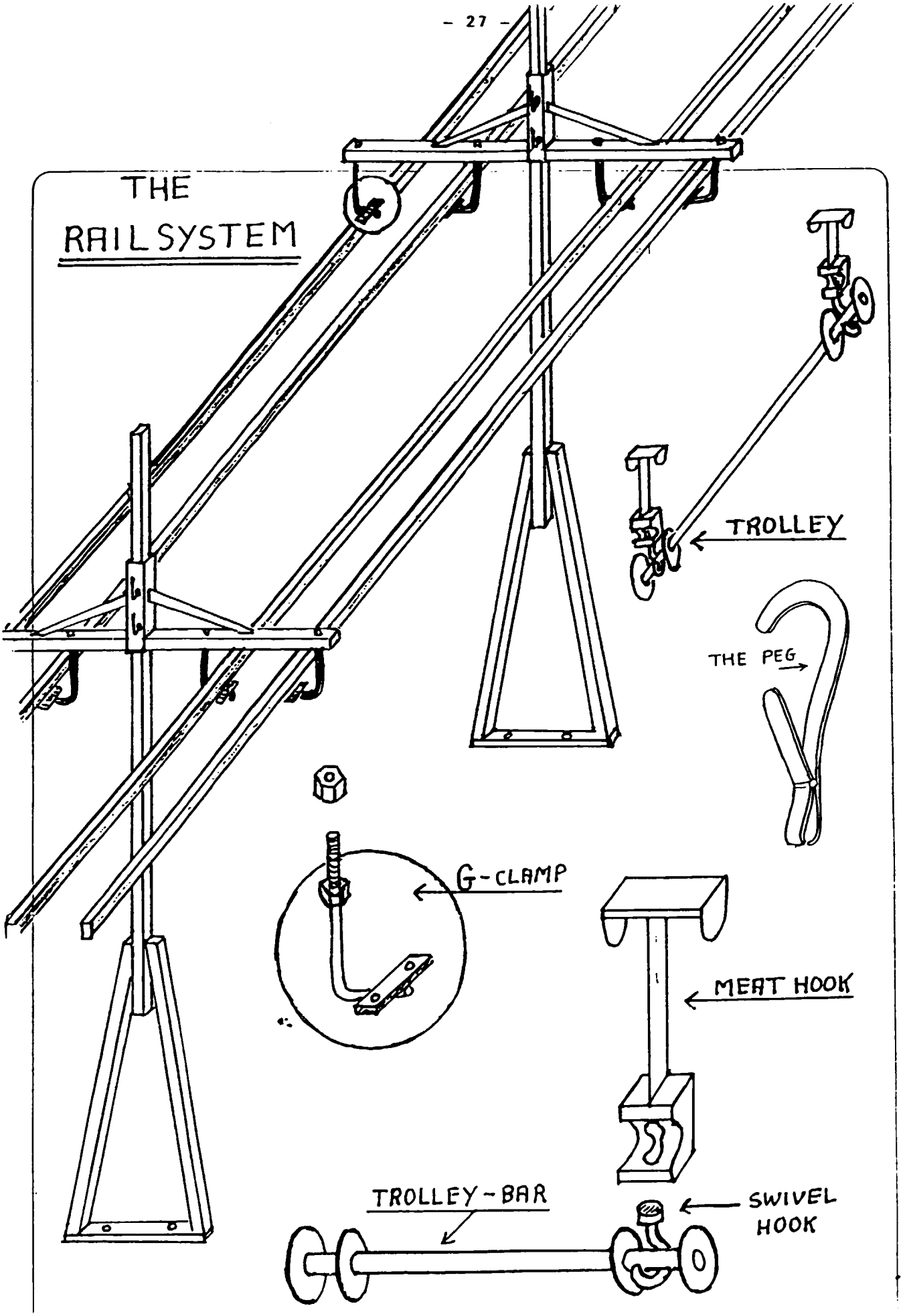
The quest to improve 'material handling' should be equal to the drive of companies to use computers to manage production planning, production progress, output recording and then ... specifying to have it broken-up into detailed stages of cost analysis. Quite often, management realises an important factor too late, that is, that a proper material handling system will improve productivity by 25% and by up to 40% when the system covers all stages of manufacturing, from cutting to .... expedition.

A great variety of systems are available; from fully computerised versions to mechanical driven but they have all one thing in common: **THEY ARE VERY EXPENSIVE.** The one factor mostly overlooked by the manufacturer in deciding for or against a 'transporter" is that with proper workloading a very simple version is often all that is needed. Where product styles change little and a production line can be kept continuously on the one product, the simple transport system will provide all the advantages of the other systems but without the high price tag.

We, W. G. Goyarts & Associates, have developed over a period of time a railsystem which is very flexible, sturdy in build and has given utmost satisfaction to the many and varied users in Australia and New Zealand. Moreover, the system can be built locally or even at the factory itself providing a reasonable mechanised workshop is available - it is the most inexpensive system.

Furthermore, when computerised production recording is required, the relevant information can be produced in bar code form utilising your existing computer system. This will allow production to be recorded per operator with the aid of a 'shared' bar code reader. Production disturbances, machine break downs, rework, sampling and other non-standard manufacturing costs can be identified by the supervisor using 'classified bar codes' to identify the 'on-cost area'. The bar code system allows a minute by minute check per operator as well as per department with all cost factors categorised.

The Rail System (see sketches next page)


THE
RAILSYSTEM
TROLLEY
THE PEG
G-CLAMP
MEAT HOOK
TROLLEY-BAR
SWIVEL
HOOK

7. GOOD HOUSEKEEPING

Good Housekeeping projects the commitment of the organisation to -

TOTAL QUALITY MANAGEMENT

Among the disciplines of good housekeeping -

- Storage of raw materials to be practical and neatly arranged.
- While cutting takes place, the wastage is placed into a wastebin immediately and not on the floor.
- All surfaces of concrete where people have to stand to be covered with special rubber matting.
- All work surfaces to be kept clean.
- All work surfaces to be kept in good order; chipped and\or broken surfaces to be repaired immediately.
- Where a drillhole-marking machine is used, a 'magic plate' must be provided so that the drill does not damage the table surface.
- All temporary storage of work to be placed in multi-storage fixtures and\or pigeon hole fixtures.
- Providing proper lighting facilities, placed in the correct position for each work station.
- Providing a 'fresh air' flow system which will extend to all areas. Overhead fans are not suitable as they push hot\stale air back onto the operators.
- Providing proper seating as well as individually adjusted seating to cover most machines.
- A general tidying-up of electrical cords and compressed air tubing, cotton stands as well as a weekly routine of machine cleaning.
- Properly maintained ironing and folding equipment including storage provisions for items needed during the operation.

- Provide all machine operators with a receptical to dispose of cottons, wrappers, used needles etc
- Provide a lay-out per section and\or group which will 'flow' the work in a logical manner.
- Provide clean toilet facilities which must include regular servicing of toilets, wash basin etc. soap, toilet paper, appropriate waste product bins and hand dryers will add substantially to the company's image as a preferred place to work.

8. MANAGEMENT TRAINING

It hardly needs mentioning that to improve manufacturing in Mauritius to an international level of efficiency requires lots of learned skills. The variety of skills as well as the scope required in garment manufacturing is to be equal or better than the best of industries. The technical advancements and applied technology over the last 20 years have been dramatic. The competitive character of the International Market Place and the shortening of Lead-Times have brought the 'rag-trade' to the foreground of manufacturing industries.

Not only are electrical and mechanical experts, computer programmers and technicians, planners, controllers, accountants, managers and supervisors needed. This industry is now dependable on CAD/CAM systems, graphic design computers, material handling systems and just-in-time manufacturing procedures.

Managers and specialised technical assistants (S.T.A's) will have to be trained in -

- Production and product engineering.
- Setting of time standards at specific effort levels.
- Product analysis to determine work loading schedules and programs.
- Develop motion economies alongside work station developments and material handling systems.
- Develop 'in-process-flow' systems to achieve "just-in-time' work practices as well as to devise production monitoring systems which will contribute to motivate 'group' performances.

- Prepare the basis for 'in-house training' programs to train and multi-skill operators.
- Prepare documentation to monitor quality control and provide procedures for **Random Quality Control** based on statistical proven evidence (statistical quality control).
- Prepare the grounds for wage improvements through a 'profit sharing bonus system', based on:

QUALITY
PRODUCTIVITY
PRESENCE
SKILLS
LEADERSHIP
ADAPTABILITY

9. OPERATOR TRAINING

For most CMT manufacturers the cost of training an operator cannot be claimed onto anybody. It forms a direct cost to the "entrepreneur". The result is: minimal training in order to obtain as soon as possible some kind of a contribution to the production by the trainee. Poor training stands for: repairs, inefficiency and a cost drain on the entire unit.

The small scale CMT entrepreneur has one further problem that , as an operator becomes proficient, she/he may quit that small factory in search for the bigger enterprise which will guarantee continuity of income.

The medium to large scale manufacturer generally will have a series of stages of progression for the trainee to follow within the organisation. The trainee can thus be 'slotted-in' at a gradual pace. The direct is more hidden, less noticeable.

However, the medium to large manufacturer has on an average a labour turnover of 30-40% which is massive and must contribute to unforeseen costs. It reflects on management's ability to understand the human resources development.

Only 15% of the factories visited had extremely low operator-turnover figures and in all cases management had a good relationship with the workers and provided "ambiance" which could be felt instinctively.

Operator training must be done according to a specific plan: the objectives are:

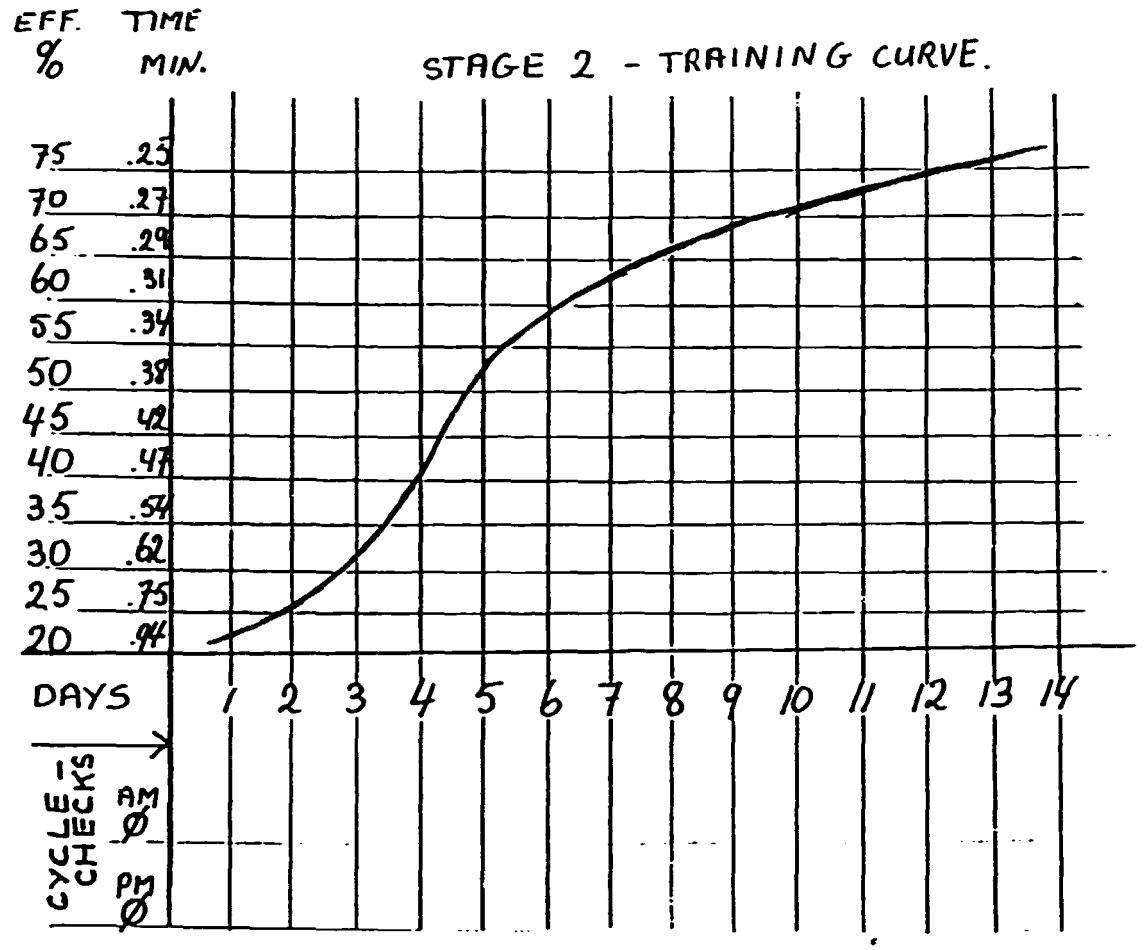
Stage 1 - The operator must gain confidence in the control of the various machine functions.

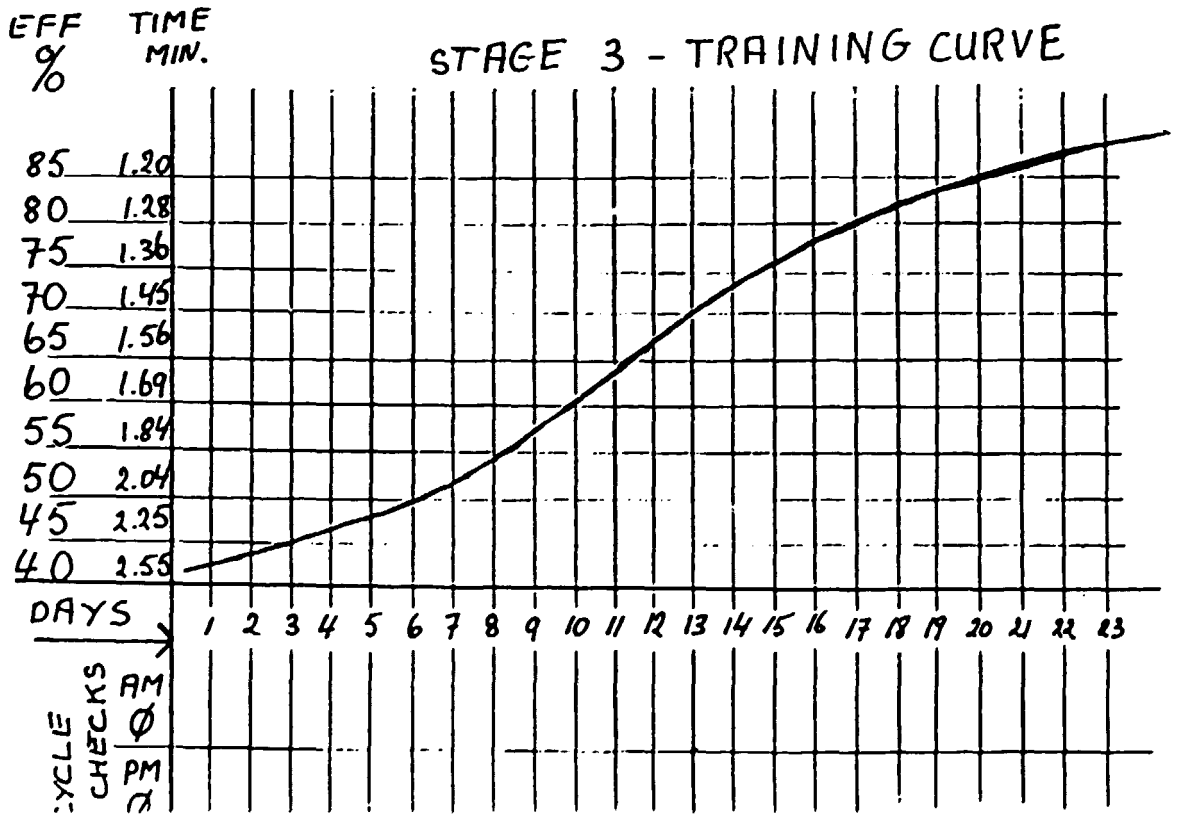
Stage 2 - A rapid progress from simple operations mostly found in the preparation section to to more complicated ones.

Stage 3 - Training the operator to do assembly line operations.

The progress of the operator must be charted and for this purpose a training curve progress chart must be drawn-up.

The training curve has on the vertical line the levels of efficiency and corresponding time values while on the horizontal line the number of 'days of training' are set out.


EFF. %
TIME MIN.
STAGE 2 - TRAINING CURVE.
75 .23
70 .27
65 .29
60 .31
55 .34
50 .38
45 .42
40 .47
35 .54
30 .62
25 .75
20 .94
DAYS
1 2 3 4 5 6 7 8 9 10 11 12 13 14
CYCLE-CHECKS
AM Ø
PM Ø


EFF %
TIME MIN.
STAGE 3 - TRAINING CURVE
85 1.20
80 1.28
75 1.36
70 1.45
65 1.56
60 1.69
55 1.84
50 2.04
45 2.25
40 2.55
DAYS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
CYCLE CHECKS
AM Ø
PM Ø

The progress of the operator against the training-curve is obtained by taking the average of 5 cycle times of the operation (use a stopwatch with 1/100 of a minute values). The operator can be checked many times per day but it is normal practice to make an entry on the graph once in the morning and once in the afternoon.

Plot each averaged time on the graph with an X for the appropriate day of training.

When an operator performs constantly below the trianing curve or there is no progress check the method.

Where the operator is afraid to move faster because of quality, cut a pile of scrap to the same dimensions and force the operator to sew at a faster speed. In most cases the operator needed some 're-inforcement' to overcome a natural concern for quality.

Most of the training information is readily available from training institutions such as the IVTB and some technical schools. Operator training on stage 1 is usually one week.

Stage 2 - 2 to 3 weeks
Stage 3 - 4 to 6 weeks

Training should be completed within 8 weeks with an established proficiency equal to the basic wage 'output' performance (= operator to earn her/his money). Most firms do not train an operator beyond this level -

THIS IS A BIG MISTAKE

A routined operator can produce at least 30-40% more than the level of output discussed above. It should be the company's policy to make the routined operator's output as standard performance.

For this elevated 'standard performance' the operator can expect a better renumeration which may vary from 20 - 33 1/3% above basic wage pay level.

The definition of a routined operator:

A routined operator knows the motion pattern by heart and performs the operation at a brisk pace right throughout the day.