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# **RESTRUCTURING THE JAMAICAN FURNITURE INDUSTRY**

**PROJECT # 532-0135 (No. FS02)**

## **JAMAICA**

## **FINAL REPORT**

**Prepared for JAMPRO  
Based on the work of J. S. Suris,  
Furniture consultant**

**United States Assistance for Industrial Development**

**\* This document has not been edited.**

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## ABSTRACT

The work was undertaken under the project "Implement a restructuring program in selected furniture enterprise. Project # 532\_0135 (No.FS02)

The objective of the project was to implement a restructuring program for a selected furniture enterprise in close collaboration with agencies especially JAMPRO and a selected group of manufacturers to insure that an effective and relevant program is pursued. The project lasted one year from December 1991 through December, 1992

A DEMAND DRIVEN PRODUCTION; the technique created to serve market demand, has been given different names and philosophies eg. FLEXIBLE PRODUCTION. In practice is a QUICK RESPONSE to production flow need, that uses the "JUST IN TIME" tool to increased the production flow with quality management technique.

Furniture production is very complex. Each product has a number of parts and each part goes through a series of common machine processes. The time required on different machines varies widely as does the time required to make one as to make a different part. To achieve a FLEXIBLE PRODUCTION in Jamaica utilizing the existing resource, a series of steps must be taken

1. The product to be manufactured must be selected keeping in mind the type of material to be used, so that low capital investment is needed with a high labor requirement (high value added). The product and product component should be standardized in each individual factory production.
2. The machines must be selected according to the component processing needs.
3. Training goals should be to achieve the flexible production requirement. The training should cover the following areas:
  - (a) Product engineering to identify material usage, design, machine utilization, and component flow.
  - (b) Production Management to develop system skills.
  - (c) Workers to develop manufacturing skills, and the use of different equipments.
  - (d) Quality control as part of the production process, rather than rejecting a finished product which is not a preventive method.

## TERMS OF REFERENCE

### PROJECT UNDERTAKEN

The following report is a result of the work undertaken from December 1991, through December, 1992. The input sources and data used in the preparation of this report have been obtained from:

- The Restructuring Programs implemented in some of the furniture manufactories.
- Discussions with JAMPRO representatives, HEART academy representatives, and Furniture manufacturing association representative
- The evaluation of HEART Academy training program.

### OBJECTIVES

- 1- The objective was to implement a viable training program to develop the furniture industry from manufacturing a single product to a multi-product flexible production system.
- 2- Review of training academies to develop a training program in which students coming out of the institution can make an impact in the industry.
- 3- Implement a restructuring program in selected furniture factories covering production system, product engineering, factory lay out, machine utilization, and machine maintenance.

### IMPLEMENTATION

Under JAMPRO in cooperation with USAID the project was to develop the above program to improve the furniture industry production system and management which include:

- |                          |                        |
|--------------------------|------------------------|
| 1. RESTRUCTURING PROGRAM | 2. PRODUCT DEVELOPMENT |
| 3. MACHINE UTILIZATION   | 4. SPECIFIC ACTIVITY   |

## INTRODUCTION

### GLOBAL COMPETITION

The world furniture industry has experienced a revolutionary change in the last ten years, these changes are fuelled by the constant develop of new country joining the core of furniture manufacturers and change in consumption pattern that influence the change in production, design and distribution system.

The most critical problem facing the industry is that of the capability of quick response to these environmental changes, and to the markets demand.

### CHANGING MANUFACTURING ENVIRONMENT

As a result to the constant market change, an strategy in which a quick response to market demands using a flexible production system of manufacturing has been developed.

### MANUFACTURING FOR QUICK RESPONSE

This new method of manufacturing demands a high level of production management to foresee production changes, to determine changing in design patterns to meet manufacturing contingencies, to increase the production flow by the elimination of waste by manufacturing product component JUST IN TIME for total Production Balance. It also demands a new approach to HUMAN RESOURCES DEVELOPMENT strategy in which multi skills labor is required to increase efficiency.

### TECHNOLOGY REVOLUTION

To meet the constant change in manufacturing process, require the need of faster control of production system, more flexible woodworking machinery and increase the use of electronic technology. Consequently the use of computers, Computer Aid Design (CAD) and Computer Aid Manufacturing (CAM) has revolutionized the furniture industry in the following ways:

- Today the industry uses computer program to improve material usage, foresee machine utilization, and manage production flow.

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- Computer Aid Design (C.A.D) is used to speed the design process and develop product engineering.
- The manufacturers of wood working machines have developed computer operated machines to meet all phases of machine operation from sharpening equipment, to patterns cutting and wood carving, resulting in the speeding of the process of change over from manufacturing one product to another

## **JAMAICA IN THE WORLD MARKET**

As Jamaica experiences painful transition from one phase of development to another, the furniture industry is also affected. This is specially so because it has grown from craft manufacturing methodology. To develop healthy and competitive furniture firms the industry will have to overcome the following problems:

- High cost of capital investment
- Lack of skill work force
- Inherited inappropriate work method
- Lack of production management

## **EXISTING PRODUCTION METHODS**

The furniture industries in Jamaica are setup primarily merely utilizing machines that fulfill the basic needs in wood processing but at the same time ignoring the high end labor input that is required. Such operations depends on the factory worker for quality, product development and engineering, and machine maintenance. The usual result is low quality and low productivity with a limited technical knowledge of the majority of the furniture worker and production management.

The products manufactured in an enterprise are made independently with no relation whatsoever to each other. This is a result of individual subcontracting of the work. Therefore, the standardization of component, the machine usage and flow are ignored, resulting in chaos within the production system.

To escape the problem of manufacturing a range of product in an environment where there is a lack of production system and not enough equipment, most furniture manufacturers use individuals or a small team of subcontractors to make the furniture. These contractors are divided mainly in three groups; manufacturers, sanders and finishers. Each of the small groups of manufacturers make the product from beginning to end and they make their way through the machinery as they make the require

component. Their agreement with the owner is to deliver an assembled product, disregarding the sanding and the finishing.

The methods and time of production is entirely the responsibility of the manufacturing team; in fact they are responsible for the design and the product engineering, as well as the production. Profitability comes from the sales margins between the cost of material, the contracts cost, and the selling price. This system reveals a number of common features:

1. Low labor productivity
2. Long production lead time
3. Delivery time is not dependable.
4. Low working capital productivity

In a flexible production environment the key is product engineering which is the linkage between sales and manufacturing. Without it an enterprise makes a product not knowing the outcome until it is finished. Product engineering identifies what products should be manufactured first, which machines should be grouped to reduce component travelling, how production flow can be increased, and how to set up a JUST IN TIME process. TOTAL PRODUCTION BALANCE.

## **RESOURCES DEVELOPMENT**

The implication of international and regional change have set a new framework for MANPOWER PLANNING and NEW EDUCATIONAL and TRAINING POLICY. Moreover this new training policy are also in needed of technical improvement and the application of new work practice.

There is not a single area of the industry that can be pinpointed as the target for development, the increasing of international competition changes in technology and changes in market demand requires an overall strategy to redefine improvement objective, rather than a fragmented approach.

## **OUT PUT OF THE PROJECT**

### **1. TRAINING**

#### **1.1. FURNITURE FIRM LEVEL**

**OUTPUT 1.1.1.** To improve the existing production system in the following areas:

- |                        |                        |
|------------------------|------------------------|
| 1. FLEXIBLE PRODUCTION | 2. DESIGN              |
| 3. PRODUCT ENGINEERING | 4. MACHINE UTILIZATION |
| 5. MACHINE MAINTENANCE |                        |

#### **1.2. JAMPRO LEVEL**

**OUTPUT 1.3.1.** Assist to establish a center for technical assistance to the furniture industry under the Productivity Center.

### **2. MANAGEMENT**

#### **2.1 COMPANY LEVEL**

**OUTPUT 2.1.1. RESTRUCTURING PROGRAM.** To restructure selected firm using the FLEXIBLE PRODUCTION approach.

**OUTPUT 2.1.2. MODULAR PRODUCTION.** To develop firm in to manufacture specialize product using modular production process.

**OUTPUT 2.1.3. INTEGRAL COOPERATION.** To utilize local machine shop in to manufacture specialize machine, jig and fixture, and repair parts.

#### **2.2 ACADEMIC LEVEL**

**OUTPUT 2.2.1.** To help to identified policies to develop the Heart Academy into a HUMAN RESOURCE DEVELOPMENT CENTER

#### **2.3 JAMPRO LEVEL**

**OUTPUT 2.3.1 SOURCES UTILIZATION.** To help develop JAMPRO ProductivityCenter so that technical assistance can be provided to the industry

## ACTIVITY CARRIED OUT ON

### 1. RESTRUCTURING PROGRAM

#### 1.1. OBJECTIVES

Flexible production by eliminating non-value added waste and using the involvement of quality production management.

#### 1.2. STRATEGY

**HUMAN RESOURCES** through technological and management change at Industry, Company, and Training Institution level to achieve the manufacturing of furniture in a cost effective way.

#### 1.3. PROCESS

- Develop a production system which plan in advance all the manufacturing process. --
- Maximize the use of jig and fixture to reduce machine setup time.
- Increase the component flow.
- Develop a multi skill labor force to increase efficiency.

#### 1.4. IMPLEMENTATION

This program consist of a six-point evaluation of each company as well as providing the necessary recommendation to upgrade the production system of each company.

Successes in the Restructuring Program have been exemplified in a gradual process of change that fits in with internal and external constraints of each firm. The process start from the fundamental change in the way the product is produced to the systems that are in place ending with the overall effect on profitability. For instance in many of the firms a blue print of the production flow including machines layout and product engineering has been provide. Training which has been an important factor has been gear to management as well as to line workers. The training include machine utilization , product development and engineering, the use of jigs and fixtures, housekeeping, value added analysis, and the principle of Flexible Production.

The external constraints which face the firms include:

- High interest rate of borrowing

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- Shortage of foreign currency for purchase of raw material and equipment
- High import duties
- Lack of manufacturing incentive

The internal constraints which face the firms include:

- Dependency of management on workers to develop manufacturing processes.
- Lack of production management capability.
- Resistance to change processes that have been in effect for many years.
- The dependance on piece-work system only as compensation.
- Lack of proper production system.
- Inability of management to plant for future needs within a comprehensive business plan.
- Lack of machinery and tools.

**ACTIVITY 1.4.1.** Developed and supervise to implement a **RESTRUCTURING PROGRAM** at eight factories. See annex # to

## **2. PRODUCT DEVELOPMENT**

### **2.1. OBJECTIVE**

Design for manufacturing and to introduce the relation of **PRODUCT ENGINEERING** between **SALE** and **MANUFACTURING**.

### **2.2. STRATEGY**

**PRODUCT ENGINEERING** The developing of product engineering to determine the manufacturing process of the company product.

### **2.3. PROCESS**

The implementation of training in furniture drawing, material usage, machine utilization and production flow at training institution and company level.

### **2.4. IMPLEMENTATION**

**ACTIVITY 2.4.1.** Ultramod ltd. company. Drawing, and product engineering was provided for the manufacturing of three sizes of a treasure box, and three chairs. This exercise includes the construction of each of the prototype.

**ACTIVITY 2.4.2.** Wood Work Ltd. company. Drawing and product engineering was provide for the manufacturing of four chairs. This exercise include the construction of prototype.

**ACTIVITY 2.4.3.** Creative Kitchen company. Drawing and product engineering was provide to standardize this company product line and product component. This exercise include the construction of one kitchen cabinet.

See annex #

**ACTIVITY 2.4.4.** Island Craft . Evaluation and redesign the entire product line to improve productivity.

### **3.MACHINE UTILIZATION**

#### **3.1 OBJECTIVES**

Improve productivity by using flexible manufacturing methods, and reducing the high level of hand labor input.

#### **3.2. STRATEGY**

To improve the selection of wood working machines. To reduce setup time. To identify machines grouping. To encourage the use of local metal working company to build specialized machinery, repair parts, jig and fixtures.

#### **3.3 PROCESS**

Hands on training in the development of jig and fixture, machine grouping, especially machine operations, and the reduce of hand labor input.

#### **3.4 IMPLEMENTATION**

**ACTIVITY 3.4.1.** Creative Kitchen. Identified accessory needs, supervise the repair of some of the machines, setup two workshop on spindle shaper jigs and fixture and on the manufacturing of french doors and windows, set up a training program for the maintenance department, identified local machine shop and supervise the construction of repair parts and machine accessory.

**ACTIVITY 3.4.2.** Wood work Ltd. Design and supervise the manufacturing of an specialize machine used in the manufacturing of chairs. Training of management and

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factory workers in the use of horizontal spindle shaper, boring machine and table saw jigs and fixtures.

**ACTIVITY 3.4.3.** Ultramod ltd. Identified machines and accessories needed to improve production system. Design an specialized machine and identify local metal shop to manufacture. This will eliminate various operation in the construction of a product.

**Activity 3.4.4.** Cameron Industries. Supervise the repair of wide belt sander and supervise the installation of the sharpening equipment. Set up three workshop to provide training to factory workers in the moulding machines, overhead router and boring machine. Provide drawing to rearrange the machine layout to increase product component flow and provide better factory space used.

## **4. SPECIFIC ACTIVITY**

### **4.1 OBJECTIVES**

Develop a production system in which productivity is a reaction to a system in place rather than of the workers performance. To develop a quality control system which is part of the manufacturing process rather than the elimination of finished products which is a costly practice. Develop the Human Resources to improve the quality of life of the Jamaican furniture workers.

### **4.2 FLEXIBLE SPECIALIZATION**

**ACTIVITY 4.2.1.** Provide technical assistance to a UNIDO consultant to adapt and implement the concept of Flexible Specialization in the furniture industry in Jamaica under the Productivity Center of JAMPRO.

**ACTIVITY 4.2.2. Workshop.** In this exercise three workshop have been set up

- 1 Product engineering, including design, material usage. drawing, route sheets, and the elimination of butse-necks.
- 2 Production system, including Production Flow, Value added analyses, Route Sheets, and the elimination of bottle-necks.
- 3 Flexible specialization to demonstrate the different between Flexible Production and Mass Production.

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**ACTIVITY 4.2.3. Company task force.** In this area five (5) company receive assistance in training a selected task force within each company to follow a 14 pint self evaluation program to develop their ability in solving problems within their own company environment.

This program help the group to identify their present status of how efficiently their present processes and management of this processes are through a mechanism of self-assessment.

The end result of this program has been edified in the capability of the participant to identify and upgrade efficiencies to the level desired.

The company which benefited were:

- Ultramud
- Mckintosh
- Magnificent Crafted Masterpieces
- Kingsnton Heirloom
- Morgan Industries

**ACTIVITY 4.2.4. Company assistance.** In this area the following company have receive assistance:

**Taylor Woodwork**

- Company evaluation and corresponding recommendation to upgrade production.
- Blue print of factory including machines and production flow lay-out.
- Design a spindle shaper, with three head and supervised a local machine shop to manufacture it. This is to be use in the manufacturing of kitchen cabinet doors to eliminate set up time every time the doors are made.
- Supervise the reconditioning of two existing machines.

**Morgan Industries**

- Company evaluation to pinpoint various problems, with the recommendation to improve through-put, production process, and machine lay-out.
- Trip to Woodwork Ltd. with the production manager to demonstrate the use of recommended machines, and to demonstrate some ideas of manufacturing processes such as material usage, machine utilization, boring, brush and edge sanding.
- Made router jig to manufacture multiple brush handles in one operation, making the especial knife to eliminate the task of bandsawing, sanding and edge sharpening.

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- Design and made blue print of a recommended boring machine to be manufactured by a local machine shop instead of importing it.

### **Leodor Aluminum**

- Meeting with the management of this company to implement an action plant to upgrade this company's production system and factory space.
- Set up a workshop at woodwork Ltd. for all the workers and management to demonstrate the following:
  - Machine utilization, boring instead of tenanting for component jointing, and machine sanding to reduce hand sanding.
  - Table saw jig and fixture to reduce set up time and eliminate component hand fitting.
  - Material utilization to reduce waste.
  - The use of jig for the spindle shaper in the manufacturing of chairs.
- Design and make blue print of recommended boring machine to be made locally.
- Supervise the instaletion of a wide belt sander, and demonstrate the use of it.

## **4.3. MARKETING**

**ACTIVITY 4.3.1.** A trip to Miami was set up and companies under the program were invited to participate. This trip lasted one week and included visit to various furniture store, lumber suppliers, furniture hardware, and furniture importers. The result of the trip are as follows:

- 1 Mr. Sivitz of Classic Furniture an importer is scheduling a trip to Jamaica to visit some of the factories to inspect their capability.
- 2 One sofa arm was supplied by and importer from Puerto Rico . A prototype was made by Ledon Ltd. and send to Miami to be inspected by the client.
- 3 I design a set of office chair and are being made at Executive Styles to be sent to Camilo Muebles in Miami.

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- 4 Two set of dining room chairs are being made at Ultramod Ltd. to be send to Miami to prospected buyers.

#### 4.4. TRAINING

**ACTIVITY 4.4.1.** Two training workshop sessions were held at Woodwork Ltd. and one at Ultramud, together with in-house training for each of the factories that has been receiving assistance.

The training has covered the following:

- Product development
- Product engineering
- Drawing
- Machine utilization
- Manufacturing process
- Finishing

Participant in the training session at Woodwork Ltd. included:

Leodor Aluminum	10 Workers	2 Management
Woodwork Ltd.	5 Workers	1 Management
Care Furniture	1 Supervisor	1 Management
Ultramud	4 Workers	1 Supervisor
Ledon	2 Supervisor	
Confurma	2 P. Engineering	1 Management

Participant in the training session at Ultramod included:

Ultramud	10 Workers	2 Management
Antique Furniture Shop	5 Workers	2 Management

#### 4.5. ACTIVITY RELATED TO THE INDUSTRY

**ACTIVITY 4.5.1.** Trough the Entrepreneurial Center visit Micro-Enterprises to set up small workshop covering various areas of furniture manufacturing.

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**ACTIVITY 4.5.2.** Assisted with technical data to people interested in setting up new companies.

**ACTIVITY 4.5.3.** Technical assistance to JAMPRO personnel in charge of organizing Expo 92.

**ACTIVITY 4.5.4.** Technical assistance to design competition organizer.

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# RECOMMENDATION

## 1. STRATEGY

To set up a short term program to initiate a turn around in the furniture industry to improve the manufacturing system which is essential that TRAINING, MANUFACTURING AND SERVICE been applied at the same time.

### 1.1. IMPLEMENTATION

#### 1.1.1. JAMPRO LEVEL

1. Create a working team to:

A. IDENTIFIED RESOURCES

B. GUARANTY COMMITMENT

C. SETUP STRATEGY

D. SETUP TIME FRAME

This team must be integrated by the following:

JAMPRO to coordinate the intervention

COMPANY to identified needs

ACADEMY to design the training

Without the involvement of any of the above group it is difficult to make an impact in the overall improvement program.

#### 1.1.2. FIRM LEVEL

1. For large firm to setup a PRODUCT ENGINEERING department to improve design, material usage, and component flow.

2. Upgrade knowledge in furniture manufacturing and its implications, by Firms management by participating in seminar, workshop, or arraigning visits to furniture shows, and local or foreign companies.

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3. Upgrade equipment , especially in the sanding department, Change the assembling method using dowels instead of denounce as jointing tool. Increase the use of local machine shop to make specialized machines and repair parts.

## **1.2. TRAINING**

### **1.2.1 ACADEMY LEVEL**

1. Modified existing training curriculums to focus on providing industry need, which includes, Product Engineering, Machine Utilization, Machine Maintenance, and Product Design.
2. Develop the CENTER FOR EXCELLENCE to provide resource development through:
  - A. PRODUCT DEVELOPMENT CENTER
  - B. TECHNICAL DEVELOPMENT CENTER
- 2 . Through the TECHNICAL DEVELOPMENT CENTER recruit industries selected staff to receive a short term in training in different areas of the production system.

### **1.2.2. FIRMS LEVEL**

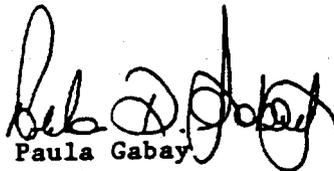
1. Select a group of company and select a group of company staff from different areas of the production system , and organize a training course to develop production skills. This course could be done at Heart with the participation of local technical capability.

# JAMPRO

## Inter Office Memorandum

22 JAN 1992  
 To: Mrs. Claudia Wynter, Director, Furniture & Wooden Products Sector  
 From: Co-ordinator, Block Grant Unit  
 Subject: CONTRACT - MR. JOEL SURIS  
 Date: January 16, 1992

Attached, please find a signed copy of Mr. Joël Suris' contract for your files.

  
 Paula Gabay

Per answer that Mr. Suris already has  
 his own copy before placing this on his  
 file.

\*cd

  
 22-1-92

December 19, 1991

Mr. Joel Suris  
Apt. 2, Fort Charles  
12 Long Lane  
KINGSTON 8

Dear Mr. Suris:

Re: Consultancy Contract With Jampro

With respect to the extension of your services for one (1) year your contract document ( No.FS 02) is hereby amended as follows:

ARTICLE III - PERIOD OF CONTRACT

The effective date of this contract shall be deemed to be September 30, 1991, and shall be completed by September 30, 1992.

ARTICLE VI - CONTRACTOR'S COMPENSATION

A. The contractor shall be paid for reasonable allowable allocable costs as set forth in the below listed budget:

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BUDGET

U.S. DOLLARS

	<u>Original</u>	<u>Extension</u>	<u>Revised Total</u>
1. Salary of US\$5,260.12 per month	44,244	63,121.44	107,365.44
2. Workmen's Compensation Insurance (DBA) at 3.1% of salary	1,373	1,956.76	3,329.76
3. International transportation one (1) return fare, Agn/Miami	300	300.00	600.00
4. Housing & Utilities for twelve (12) months	11,626	15,500.00	27,126.00
5. Shipment and storage of household effects not exceeding 2,500 lbs.	2,500	2,500.00	5,000.00
6. Reimbursement of Life Insurance Premium not to exceed US\$500.00	375.00	500.00	857.00
7. Reimbursement up to 50% of Medical Insurance not to exceed US\$1,361	1,025.75	1,361.00	2,386.75
8. Miscellaneous (communications, physical, visa, inoculations, etc.)	185.00	185.00	370.00
	<u>61,628.75</u>	<u>85,424.20</u>	<u>147,034.95</u>

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Reimbursement of all costs, excluding salary shall be made in accordance with the standardised regulations and/or USAID-Jamaica Mission policies governing the reimbursement and/or payment of such costs to US Direct hire employees assigned to USAID/Jamaica.

**B. Maximum Obligations:**

(i) The Maximum Obligation under project #532-0079 for the period September 1, 1986 to September 30, 1990 was US\$254,020.00.

(ii) The total obligation under this contract, Project #532-0135 is US\$147,034.95. The Contractor shall not exceed this amount of US\$147,034.95 without prior approval of the organisation. The contractor shall maintain adequate records to assure that obligations and/or expenditures are at all times within the maximum obligated amount and shall notify the organisation at least 30 days in advance of any expected additional funding requirements.

**Article XII - Relationship of Parties**

The contractor will report directly to the Group Director, Manufacturing or his/her nominee. His duties will be substantially those incorporated in the attached "Statement of Services", Annex I.

**Work Week**

The contractor's work week shall not be less than 40 hours per week, and will normally consist of 8 hours per day, 5 days per week, Monday through Friday, from 8:30 to 4:30 p.m.

Yours truly  
Jamaica Promotion Corporation

I.V. Brown  
President

Signed: \_\_\_\_\_

President

Signed: \_\_\_\_\_

Joel Suris

Date: \_\_\_\_\_

Project No.: 532-0135/Pil 43

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ANNEX I

STATEMENT OF SERVICES

MR. JOEL SURIS

1. Provide assistance to registered factories in the areas of:
  - wood preparation
  - plant layout
  - product/prototype development
  - product engineering
  - machinery and equipment requirements
  - machine technology
2. Update investment costing sheets for the establishment of three types of furniture operations.
3. Provide technical assistance for prototype development of furniture designs selected in the Design Competition.
4. Provide technical support (product engineering) for the Design Centres' Furniture Design Programme.
5. Provide support for any other relevant activities being pursued by Jampro i.e. export related (Furniture Focus) and investment related.

JOEL SURIS  
CONSULTANCY PROGRAM  
FOR THE PERIOD  
JANUARY TO DECEMBER 1992

I. INTRODUCTION:

A. The Furniture Industry as a whole has improved in the last 6 years with better designed and engineered products, especially in the area of finishing. Another area that has improved is the increased amount of Architectural Millwork and furniture sourced locally for the Hotel Industry. Two relatively big factories have been set up mainly for export. Even though this progress is significant, very little improvement has occurred in production facilities in the rest of the industry and most of the manufacturers use the Craft-type manufacturing process, resulting in low productivity and/or poor quality products, making it almost impossible for the majority of the enterprises to consider the export market.

In Jamaica, the only means of subsistence for the furniture industry is to supply the local market. Because of its nature, requiring household furniture, architectural millwork, products for the hotel and construction industries, it is necessary for furniture manufacturers to use the same factory facility to produce multiple-type products. Consequently, in order to develop a multi-product flow system, there must be a certain amount of change in the structure of the existing enterprises and the way in which work is organized and managed.

In order to meet this need, a RESTRUCTURING PROGRAM is necessary to increase the rate of Production Flow, improve Product Engineering, Product Design, and Quality Control, thereby generate greater productivity. In today's world, successful firms are those in which multi-products can be manufactured without sacrificing the material flow throughout the production process.

B. To have an efficient Restructuring Program, there are three areas that have to be considered - sales, production and management. It is the function of the management to effect the link among the three areas. Management that ignores the relationships between sales and production create an imbalance in an enterprise's ability to function. Therefore, management must ensure that the companies manufacture products that are salable. To achieve this goal, the Consultancy Program for the period January to December 1992 has been structured as follows:

- Assistance in a program of restructuring of selected enterprises which will include selected companies as well as the firms which have made financial contributions in support of this Program.
- Assistance to selected firms in specific areas which will have an important impact on the achievement of high levels of productivity in these firms and the Furniture Industry, as well as contributing to the overall program of restructuring.
- Set up a program to monitor:
  - 1) The processes involved in the restructuring of the companies, as well as
  - 2) the progress of the Program itself.

## II. PLAN OF ACTION:

The focus of the above assistance will involve assessing the Furniture Companies in regard to their Production Process - mainly in the Routing System; Floor Plan and Machine Layout; Machine Utilization; Product Engineering and Product Standardization; as well their Accounting, Financial Analysis and Organizational Systems - primarily with a view to increasing the level of exports of the Furniture Industry.

## II-A Company Evaluation

The purpose of evaluating the Furniture Companies is strictly to identify methods to upgrade management and improve the production process. The evaluation will be concentrated in the following areas:

- Product line: To establish the feasibility of the products being manufactured.
- Product engineering: To identify how product component standardization can be achieved; to identify how to improve material use, design, route sheet and construction method.
- Machine utilization:
  - To identify how to maximize the use of the machinery
  - To identify areas where a machine activity unit can be set up to quicken material flow
  - To identify Jigs and Fixtures to minimize set up time
  - To identify if machinery and tools need to be upgraded.
- Production system: To establish the production and quality control system as well as the manufacturing process to be used.
- Manufacturing area: To establish the new Production and Machine Layout.
- Cleaning/Organization: To improve house-keeping, organize Jigs and Fixtures and improve working conditions.

## II-B Recommendations:

A list of recommendations will be provided for the management to review and to make the necessary comments. If agreed upon for implementation, the revised recommendations and a plan of action will be put in place within an appropriate time frame so as to monitor the progress to be made.

## II-C Assistance to implement the recommendations

Successful restructuring depends upon establishing a strategy to guide the process. The management task is to use the resources available and to apply them within the specific context of each company.

## II-D Training of selected personnel

The training will be subject to the company's needs, not so much to develop the cabinet making skills of the company's workers but rather to increase their knowledge of production processes to increase their ability for problem solving, product engineering, etc.

## II-E Workshop on specific areas of production

There are problems that are consistent within the Furniture Industry, especially with the quality of finished products. Some of these problems appear in one area of production but are caused from reactions in a previous step along the production process. A series of Workshops are planned to identify and correct these problems. Some of these Workshops will cover:

- Furniture Sanding or preparing for finishing
- Jigs and Fixtures to reduce machine setup time
- Furniture Designing and Product Engineering
- Manufacturing kitchen cabinets.

## II-F Implementing a time frame to upgrade the factory

The success of the Restructuring Program depends on the strategy used to guide the process, and the framework for developing action plans. The need to have a time frame in which to develop the Restructuring Program is what establishes a unifying framework necessary for teamwork.

### III. APPENDICES:

III-1 Product Evaluation

III-2: Product Standardization

III-3: Restructuring Program Monitoring Program

III-4: Product Line Questionnaire

III-5: Production System Questionnaire

III-6: Product Engineering Questionnaire

III-7: Machine Utilization Questionnaire

III-8: Manufacturing Area Questionnaire

III-9: Finishing Questionnaire

**RESTRUCTURING PROGRAM**

**CAMERON INDUSTRIES**

*Report prepared by*

*Joel S. Suris*

*for*

**JAMPRO**

*January 8, 1992*

## CAMERON INDUSTRIES.

### 1. Introduction

Cameron industries is one of the eleven firms which has made financial contribution to support the Restructuring Program. This company main product is Architectural Mill work, Panel Doors, French Door and Windows, and Kitchen cabinet.

Cameron industries enjoyed a good percentage of the supplied of their product to the local market. They are beginning to consider the export market. Their product is of a good quality.

At present they have a outlet in Kingston to market their product locally.

Mr. Cameron has stated the plan of separating the Kitchen manufacturing from the Mill Work manufacturing area, and at present they have euploid two new staff to take care of the production planing and engineering. They are the only Furniture Company in Jamaica that have a Computer Program for kitchen cabinet manufacturing, this program has improve their sale considered.

### II. Company Evaluation

On January 8, 1992, Cameron was visited by Mr. Vivion Scully, Promotion Officer, and Mr. Joel Suris, Technical Consultant, to make the preliminary evaluation of the company with a view to establishing the process of restructuring this company's production system. There is a six-point evaluation to cover all phases of the company's present structure.

There are three areas where this company need attention, Machine Utilization, Machine Layout, Production System.

#### II.A- Product line

Different from must Jamaica Furniture Manufacturing, Cameron Industries has three specific line of product:

- Kitchen Cabinet
- Architectural Mill Work
- Panel Doors, and French Doors and Windows

Except for Architectural Mill Work which must of it is costume made to specification, a great deal of standardization can be achieve in this company product line.

## II.D- Production System

The Production System need to be improve. Orders are received and the administration prepares the production order of the product to be manufacturing. This is given to the cabinet maker who is going to manufacture the order. He is responsible for collecting the lumber required and manufacturing the unit from beginning to end. Most of the supervisory work done at present involves monitoring the work for quality and seeing that it is done in the time specified, but everything depends on the ability of the workers themselves for the product output. Quality control and other production measurements are by verbal commitment only, since there is no system in place that monitor the production process.

Attention must be given to the fact that multi-product component are prepared in the same production area, and each component receive different amount of machine operation, this resold in a congested production flow.

Productivity and Quality is a reaction to a Production System in place. The per-piece payment system give some advantage in the cost control, but at the same time the work force must be supplied with a system that help them being more productive and produce a product of better quality. The Production System must provide an ease product flow throughout the production process, reduce time wasted when no value has being added to product component, and provide the worker with the system that enable them to identified mistake, bottle neck, machine task sequence, before the product component received more work put in to it.

## II.B- Product Engineering

Product Engineering is the linkage bitewing Sale and manufacturing of a product, without, the product is made without any knowledge of how the product will come out until it has been made. Product Engineering affects:

- Dicing and look of the product
- The material and how it is going to be used
- The machine use to transform material into product component
- The construction method use to put product component together

Cameron industries has a good product engineering system place, as stated before is the only company that has a computer program for kitchen cabinet manufacturing. But the system seems to

be used only for administration purpose. Must of the actual engineering is done by the man that make the product. In this company multi-product production, the product engineering must take in consideration the different type of product component being manufacturing, and the different type of material being used, and develop the system that enable the worker reduce machine task, machine set up time, assembling time, and must of all reduce the time a worker take to make a product.

## II.C- Machine Utilization

Cameron Industries have a considerable amount of machinery. This machinery has being purchased as needed to preform certain task in production. The machine are not use to increase output, or to reduce labor input, rather to provide a service to factory worker. As the company grows, more workers enter the production process, therefore more machine are added.

- Component are planing four time to achieve the with and thickness desire.
- Ripping is done by hand pushing
- All joint detail are done mostly in the table saw
- No stop guide is set up in the machine to make jointing mortise on door stiles, rather each one is mark by hand.
- Set off to size is done in the Radial Arm saw

The following is the list of existing machinery and their condition.

5- 10" Table Saw	good condition
1- 2 x 4 Molder	fair condition
1- 24" Band Saw	good condition
1- Louver grooving	good condition
2- 14" Radial Arm Saw	good condition
2- 20" Thicknesser	good condition
1- 8" Joiner	good condition
1- big Spindle Shaper	good condition
1- Spindle shaper	good condition
2- Grooving/boring machines	Need adjustment and stop guide

1- Small Thicknesser	Fair condition
1- 54" Wide Belt Sander	good condition
1- 12" Wide Belt Sander	Good condition
2- 12" Joiner	good condition
1- Ripping Saw	Need adjustment
1- Over-head Router	Good condition

## II.E- Manufacturing Area

The total building area is \_\_\_\_\_ s.f. which is divided as follow:

Manufacturing area .....	_____	s.f.
Lumber stack area.....	_____	"
Finishing area .....	_____	"
Office and Administration.....	_____	"

The manufacturing area is not divided properly, taking into consideration the production process, but rather it is organized by selecting an area where machines are concentrated to minimize the moving of components, which means that half of the manufacturing area is used for component processing and the other half is used for assembly. This is due to the size of the manufacturing area which is small for the amount of work being process. The biggest problem is that there is at present a lack of moving space due to the amount of machinery, and of products being process lying around, in addition there is a sizeable amount of unused lumber and part laying around which clutter working space. It is considered that only 60% of the manufacturing area is in use.

There are two more floor that are use one for finishing and the other is used for lumber stock.

## II.F- Cleaning and Organization

Cleaning up, keeping everything (machinery, entire working areas, etc.) clean at all times is not given sufficient attention. There is a lot of old part, and on use wood lying around.

Cameron Industries has a good Dust Collection system in place, which collect must of the dust produce by the machinery.

## II.G Finishing Area.

No spray booth exists in the factory, therefore the dust falls back onto the product being finished. The spraying is done mainly in an open area, not in an area enclosed with the sufficient dust extractor to maintain the finishing area free of dust and fume.

The product being manufactured mainly requires sanding sealer and clear lacquer, and primer and colored lacquer, very little stain is applied.

### RECOMMENDATIONS FOR RESTRUCTURING CAMERON INDUSTRIES.

Cameron industries have shown to have the potential to supply most of the Architectural Mill Work for the local market, furthermore can be a key factor in reducing the importation of Wood panel Door into Jamaica. This is a result of the overall quality of this company's Management and the product they manufacture. Taking this into consideration the following are recommendations to be reviewed by the Management of this company. The recommendations have been developed taking into consideration the company's size, products manufactured and the constraints of this Enterprise.

Productivity is a reaction to a Production System in place, which includes all the necessary tools, for eg. adequate machinery and accessories, good product engineering, good manufacturing processes, production flow and production control will result in higher productivity. This means that the factory workers are productive not because they work harder, but because they are responding to the system in place that guides them. In Cameron Industries some of these requirements are missing, therefore increases in productivity and product quality are measured against previous experience, which is a reflection of the workers' performance, not an improvement of the system. To overcome this problem, this enterprise must be restructured taking into consideration all the areas analyzed previously.

#### Product line

It is recommended for this company to continue with the present product

#### Production System

Most Jamaican manufacturers depend on the worker to develop the way a product is going to be made. Consequently, the administration has very little control over the production

process. (This is as a result of piece work payment). In Cameron Industries, because of the multi-product production, a Production System is required that enables the administration to have control of the production at all times. This can be achieved only by dividing the Production Process into areas. In this way, any problem that may arise can be corrected before it causes any detrimental consequences. Quality Control must be built into the Production Process. Machine layout must ensure a continuous flow of the product components being manufactured. The product must be engineered in such a way as to ensure the best use of the machinery and workers' skills. Taking all this into consideration, the following are recommendations for the set up of the Production System:

- Divide the Production System into four areas, to have better Quality Control, to identify bottle-necks, to set up machine tasks more effectively, and to have a better control of the process:

1- Rough Mill to ensure the quality and better use of the lumber, and easily set up priority for the product being manufacturing.

2- Machining to ensure control of the machine tasks, and to easily identify bottle-necks, set up machine task unit, and easily set up component flow.

3- Assembling so that the assemblers can act as quality controllers. Every product component that enters this area is to be inspected for quality before it is assembled. The Assembling Area provides better control of the product that is going to be finished.

4- Finishing. After assembling, all products are warehoused and finished as required.

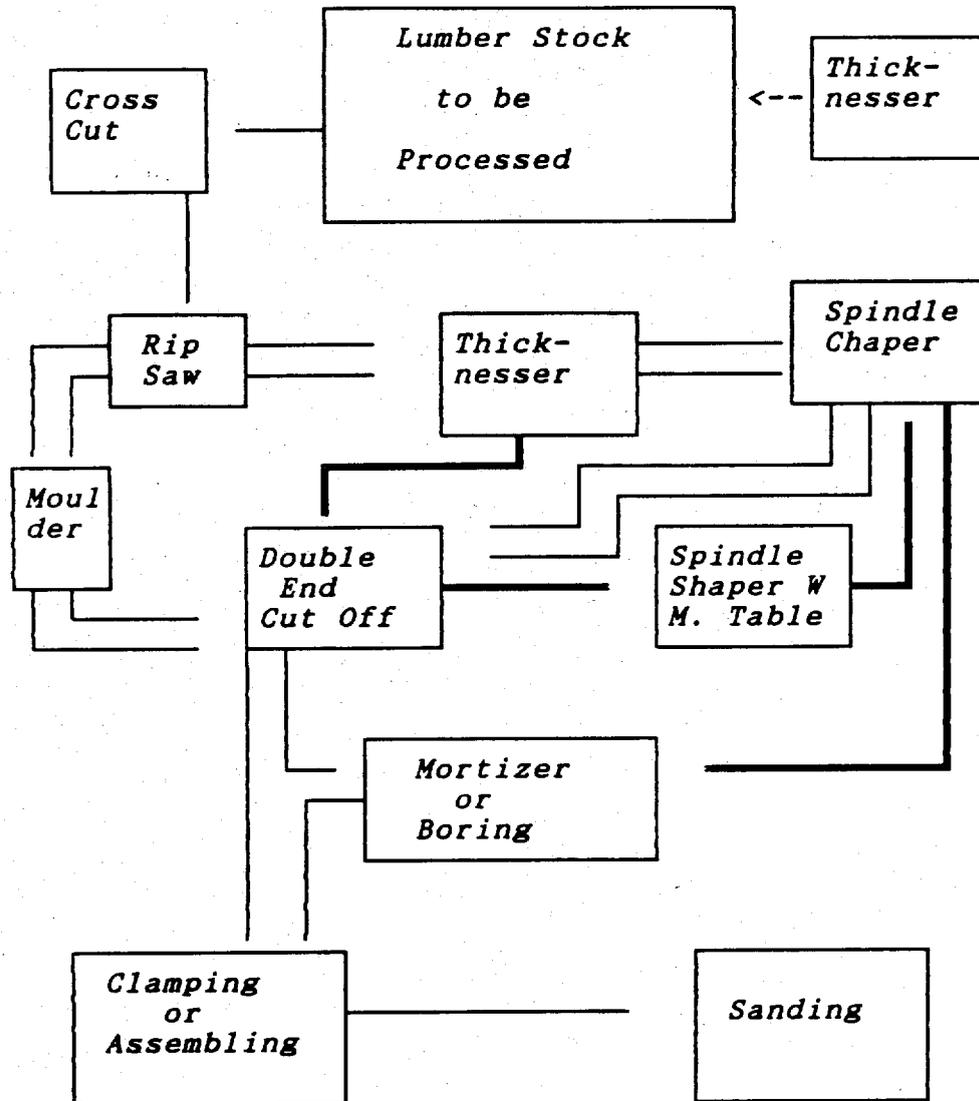
- Assign a person to be in charge of Product Development, Product Engineering, and to monitor the Production Process.
- Set up the Rough Mill Area so that one person is responsible for preparing of all material for each product to be made. This will ensure that the lumber selected is of the quality desired, and reduce lumber waste.

**Note:**

**At present the workers are paid per finish unit. To adjust to the new Production System the unit payment must be divided in four areas:**

- Rough Mill - Machining - Assembling - Finishing**
- Rough Mill and Machine Sanding should be paid by hour**

Following is a diagram that explain the Production process rout for Panel Door, French Door, and Door Frame, using two system, one using the molder, and the other using spindle shaper, to identified the extras step when using the spindle shaper



>>>>> Door Frame Process

\_\_\_\_\_ Door Process for Door Style

===== Door process for Top, Baton, Upright, Cross Piece, and Panel.

## Product Engineering

Product engineering is the link between sales and manufacturing. Without a product engineering system in place, the product is manufactured without knowing how it is going to look until it is finished. Starting from the design, Product Engineering is the tool used to determine the amount of material that is going to be used, the type of construction and the way a product's components are going to be put together. Above all, Product Engineering determines how the machines are going to be used to perform the various tasks by which a piece of wood is transformed into a product component.

The success of a company depends on how much is known about how the product which is going to be produced before the raw material enters the production system. In Cameron Industries, having a multi-product production, the key to increased productivity is to provide to the workers who are going to make the product detailed information on how the product is going to be made, so that they can concentrate on manufacturing it.

Following are the recommendations to set up the Product Engineering system:

- Employ a person to be trained to be in charge of the product engineering and development.
- Standardize as much as possible the product components, specially in regards to whatever machining is to be done, so as to reduce machine utilization and increase production flow.
- Make a Route Sheet for each product component, mainly to provide a guide for each operation in the production process, and to establish each machine task.
- Make an extra sample of all the product components for which repeat orders are expected so as to ensure quality control and eliminate hand fitting.
- Change the mortise to dowel joint to increase the output, when is reduced the time that takes to perform this operation.
- Standardize all cabinet front frame to reduce construction time, grove the assembled frame for side and baton to facilitate the assembling, this will facilitate to install the door before the cabinet is assembled.

## Machine Utilization

The success of this company in providing Architectural Millwork, and door for the local market indicate that an evaluation of the existing machine must be done, taking into consideration the product components being manufactured, the machine needed to reduce labor input, and the production output require.

The increase of production in a multi-product enterprise depends on the reduction of hand work, and how efficiently the machines are used, specially in regard to reduction of set-up time. In Cameron Industries, a lots of extra work is put into the product being manufacturing, especially when manufacturing door and windows component.

To identified the machine needed to manufacture a product, the following have to be identified first.

- The different part of a product
- Work performed on each product component

### 8 panel door component

2 styles

1 top

Require 16 lineal feet of the same shape molded wood

3 crosspieces

4 upright

Require 12 lineal feet of the same shape molded wood

1 bottom

Require 2 lineal feet of molded wood

8 panels

require 10 lineal feet of molded wood

### French door component

2 styles

1 top

require 16 lineal feet of the same shape molded wood

3 crosspieces

4 upright

Require 17 lineal feet of the same shape molded wood

1 door bottom

Require 2 lineal feet of molded wood

There are 8 typical operation or task performed on any product component, regardless of the product being made. The easier and most efficient way that this task are performed the faster the product component flow trough the production process. The quality of the product depend on the means use to performed this task. Following are this operation:

<u>Operation</u>	<u>Machine</u>
THICKNESSING/PLANNING	Edge planing Thicknesser
ROUGH CUTTING	Radial Arm Saw Air Cross Cut
STRAIGHT RIPPING	Table Saw Push by hand Table Saw with feeder Straight Line Rip Saw
IRREGULAR RIPPING	Electric Jig Saw Band Saw
CUT TO SIZE	Table Saw Double end Set Off Saw
EDGE SHAPING	Hand Router Overhead Router Spindle Shaper Molder
SURFACE SANDING	Electric Hand Sanding Edge Sanding Wide Belt Sanding
JOINTING PART	Mortise and Tennoner Boring

The woodworking machine are design according to the task they perform and the output require. According to the output require there are other sophisticated machine not including in this report.

Taking the above into consideration Following are the recommendations to improve utilization of the machinery.

- \* These item are the ideal machine to improve production out put, and decrease labor input

- \* - Purchase a 3 X 8 molder to eliminate thickening door component four times, and to increase the quality of the component
- \* - Purchase a straight line rip saw to eliminate jointing, hand pushing, therefore increase production.
- \* - Purchase a boring Machine to make the jointing of product components easier.
  - Set up two adjustable shop saw to set up all door component to increase productivity.
  - Purchase shaper knife to make tennonner at the same time the end-shape is done for top and baton of door component.
  - Install stop guides on the mortise machine to eliminate the hand marking for each cross piece of the door component, and to ensure occurrence.

#### Manufacturing Area

The manufacturing area must be divided according to the Production System, especially when the area is relatively small.

The Rough Mill Area is critical to an organized Production Process, because this is the area in which production is started and all the material for the product components is prepared, in this area the material will be:

- Cut to rough size
- Rip to width
- Mould if a molder is in place. Thicknesser to the width and thickens

The rest of the Manufacturing Area must be divided taking into consideration the production flow or component movement. The Machine Sanding Area must be between the machining and assembling areas.

The following are the recommendations to set up the Manufacturing Area:

- Make blue print of the factory with the machine layout in accordance with the Production Process.

- Set up the Rough Mill where the machines are at present.
- Move the Machining where the assembling is at present
- Set up small assembling table with corresponding assembling horses so that the table is used only for product components.
- Make shelving unit to store the product components that are awaiting assembly.
- Set up a different shop for kitchen cabinet (in progress at present). Use the same Rough Mill to prepare solid wood component for cabinet, and for other product

### **Cleaning and Organization**

The way the factory looks is a reflection of the Production System. If the Manufacturing Area is not clean and well organized, it is impossible to have organized production. The following are the recommendations for organizing the Manufacturing Area:

- Identify aisles for component movement.
- Set up an area to store all Jigs and Fixtures, Saw Blades, Router Bits, Shaper Knives, and Bandsaw Blades.
- Make trucks in which to move product components, so as to prevent them from being scattered all over the floor. This will make the handling easier when the workers are processing them.

### **Finishing Area**

The Finishing Area has to be set up to facilitate the movement of the product being finished. Adequate dust extraction must be installed to eliminate the fall back of fumes on the products being finished. The finishing material must be selected so as to give the correct finish to each product. It is absolutely necessary for the air compressor and spraying system to be adequate to achieve a constant finishing application. The following are the recommendations to improve this Area:

- Set up a spray booth and dust extraction system.
- Ensure that the machine and hand sanding is done with the proper sanding paper, using heavy grid at the beginning and reducing proportionately until it reaches the final sanding required.

### TRAINING PROGRAM

Training is part of the Restructuring Program. To ensure the required results, the Training Program must be endorsed by the administration. It is most important that the administration make the commitment that any change put in place is going to be followed up to ensure continued progress.

- Set up a training program for the Product Engineering. To improve material use, improve construction method, and ensure the quality of the product. This includes training in:

- Route Sheet Preparation
- Material use
- Construction method

- Set up training program for Machine Utilization. To reduce machine set up time, and improve the quality of the finished product. This includes training in:

- Jigs and fixtures
- Boring
- Spindle Shaper
- Machine sanding
- Machine Task evaluation

- Set up training program for Production System. To identify bottlenecks, ensure quality control, and control of the production process. This includes training in:

- Production Flow
- production control

Annex # 4

**RESTRUCTURING PROGRAM**

**ULTRAMOD LIMITED**

**Report prepared by**

**Joel S. Suris**

**for**

**JAMPRO**

**February 10, 1992**

## ULTRAMOD LIMITED

### I. Introduction

Ultramod is one of the eleven firms which have made financial contribution to support the Restructuring Program. This company's main product is custom-made furniture, including office furniture, dining room tables and chairs, occasional office chairs, and some work for the hotel industry. Their product is of a very good quality for Jamaican standards.

Mr. McDonald has stated his interest is restructuring this company - including, developing a complete new line of furniture, to supply their new furniture store to be opened. The new line of furniture includes:

- Three contemporary Dining Room Sets
- Three contemporary Bedroom Sets
- Three contemporary Living Room Sets
- Children's Back Beds, Under Beds, Desks/Drawers
- Two models of Home Office Furniture
- Three types of Office Desks and Credenzas.

The above furniture will be finished in both color and natural finish, including some mahogany finish. The material used will be Poplar, Solid core Plywood, Melamine, and E.D.F.

Mr. McDonald has shown interest in setting up a Product Engineering Department to ensure quality and reduce manufacturing problems.

### II. Company Evaluation

On January 15, 1992, Ultramod was visited by Mr. Vivion Scully, Promotion Officer, and Mr. Joel Suris, Technical Consultant, to make the preliminary evaluation of the company with a view to establishing the process of restructuring this company's management and production system. Following is a seven-point evaluation to cover all phases of the company's present structure.

## II.A- Product line

Like most of the manufacturers in Jamaica, Ultramod is a multi-product company with the exception of a few pieces, most of the product being custom-made furniture, custom-made because of the nature of it; every piece is different. This leaves little room for product standardization.

At present, this company makes a large range of furniture, including:

- Office desks made out of cedar or mahogany
- Office counters for reception, computer, cashiers, etc.
- Office furniture, chairs, occasional tables, planters, etc.
- Dining room furniture, tables, chairs
- Living room furniture, sofas, chairs, tables, etc.
- Hotel furniture, dressers, desks, head boards.
- Construction Industry - closets, kitchen cabinets, door frames.

Because none of these orders are in quantity, or consist of items that are going to be made again, the chance for error in the construction is high, added to which the lack of product engineering creates a dependency on the worker for the quality expected.

The finish needs to be improved mainly in the previous production process, also the use of man made material.

## II.B- Production System

Ultramod's production system is divided into four areas:

- Material Preparation. Here the lumber is prepared.
- Assembling, which is in charge of manufacturing the product
- Hand sanding and
- Finishing

There is no proper production system in place. Orders are received and administration prepares a sketch of the furniture to be manufactured. This is given to the cabinet-maker in charge of preparing the material. He is responsible for collecting the lumber required and preparing it to a rough size. The material is then given to assemblers responsible for manufacturing the unit from beginning to end. Most of the supervisory work done at present involves monitoring the work for quality and seeing that it is done in the time specified, but everything depends on the ability of the workers themselves for the product output. Quality control and other production measurements are by verbal commitment only, since there is no proper production system in place.

The result of all this is that the Production Manager does not have control of production and has no system by which to convey instructions to the production workers.

## II.C- Product Engineering

The product made by this company reflect poor product engineering which at present is developed by the men who make the products. There is a system in place of regulating how the materials are going to be utilised, but mainly for quantity use only. The work that enters into the manufacturing process is evaluated by administration mainly for the purpose of arriving at the overall cost in order to determine the selling price. The remainder of the engineering process may be discussed with the technical person in charge of production. Consequently, it devolves on the workers to be responsible for making the products the best way they can without there being any proper production system in place.

- Every prototype is made on the trial and error basis because the workers have no drawings to follow.
- Except for work for clients who provide full drawings, the products made lack proportion.
- Even though there is a boring machine in place most of the joints are made using tenon.
- Chair back legs are band sawed and then smoothed by hand.
- Melamine is not fully utilized
- Every part of the product being manufactured is constructed and fitted one piece at a time.
- Every joint is held together by nails because of the lack of small clamps.

## II.D- Machine Utilization

The biggest problem of Ultramod is the lack of machinery and accessories, especially since maintenance of the machinery is poor.

Most of the saw blades are in need of sharpening. The bandsaw machine is either without or has the wrong type of blade. Router bits are used without sharpening until they burn the wood, and sanding machines are used with the wrong sandpaper most of the time. There is no one standard for machine utilization. Machines are in the factory to provide a service to the cabinet makers rather than with the idea of improving production output by eliminating hand work in the case of machine sanding, or having a boring machine so that every joint does not have to be made by hand, or that the wood does not have to be rough sanded by hand.

The lack of a proper maintenance system, which includes taking care of the sharpening of tools, providing knives, bits, saw blade, band saw blades means that the work is of poor quality, or takes more time to complete them than is necessary.

- Router knives are dull, or with broken parts, causing the wood to be burnt.
- Band Saw needs blade guide, proper motor pulley, therefore no smooth cut can be achieved
- Hand router needs working table, therefore two men are needed to route a job instead of only one
- Band saw blades are the wrong ones, most of the time, and as a result the operation takes longer.
- There is no variation of sanding belt, therefore the job is not properly sanded, consequently poor finish only is achieved
- All the shaping is done by hand or by hand router.
- All finish sanding in band saw component is done by hand, resulting in a poor finish
- Very little dowel is used to joint components, resulting that tenonning is done in the table saw

Following is the list of existing machinery and their condition.

1- 10" Table Saw	good condition
1- 10" Table Saw	fair condition
1- 14" Band Saw	needs blade guide and motor pulley
1- 14" Radial Arm Saw	Table needs repair
1- 24" Thicknesser	Needs repair of table mechanism
1- 12" Thicknesser	Needs repair of table mechanism
1- 8" Joiner	good condition
1- Stroke Sander	Table needs motor
1- Boring Machine	Table needs repair

#### II.E- Manufacturing Area

The total building area is 4264 sq. ft. which is divided as follow:

Manufacturing area .....	_____	s.f.
Lumber stack area.....	_____	"
Finishing area .....	_____	"
Warehouse and show room .....	_____	"
Office area.....	_____	"

The manufacturing area is not divided taking into consideration the production process, but rather it is organized by selecting an area where machines are concentrated to minimize the moving of components, which means that half of the manufacturing area is used for component processing and the other half is used for assembly. This is due to the size of the manufacturing area which is very small. The biggest problem is that there is at present a lack of working space. In addition, there is a sizeable amount of unused lumber, old furniture and rubbish which clutters up the working space. It is considered that only 60 % of the area is in use.

## II.F- Cleaning and Organization

Cleaning up, keeping everything (machinery, entire working areas, etc.) clean at all times is not given sufficient attention in Ultramod. There is a lot of rubbish lying around, dust is all over the furniture being manufactured and finished work clutters up the area. Lumber in use and lumber left over from previous jobs is on the floor as well as in front and on top of machinery. There are no moving trucks, so components are all over the floor.

## II.G Finishing Area.

Finishing is poor, mainly as a result of poor machine sanding which hand sanding cannot correct. This results in an inconsistent finish.

No spray booth exists in the factory, therefore the dust falls back onto the product being finished. The small fans do not extract the fumes created by the spray guns. The paint pots are not use properly. The area where finishing is done is open to the rest of the factory.

## RECOMMENDATIONS FOR RESTRUCTURING ULTRAMOD LIMITED

The following are recommendations to be reviewed by the Management of Ultramod. The recommendations have been developed taking into consideration the company's size, products manufactured and the constraints of this Enterprise.

Productivity is a reaction to a production system which includes all the necessary tools, for eg., adequate Machinery and Accessories, good Product Engineering, good Manufacturing Processes, Production Flow and Production Control will result in higher productivity. This means that the factory workers are productive not because they work harder, but because they are responding to the system in place that guides them. In Ultramod, some of this is not in place, therefore increases in productivity and product quality are measured against previous experience, which is a reflection of the workers' performance, not an improvement of the system. To overcome this problem, this enterprise must be restructured taking into consideration all the areas analyzed previously.

### Product line

COMPANY'S NEW FURNITURE LINE: ( Listed in the introduction)  
This company's new line of furniture must be designed taking into consideration the standardization of the product, and the product component.

CUSTOM MADE PRODUCTS. The Manager of Ultramod must monitor the amount of Custom Made products, because of the factory size. There are two areas of custom-made products:

1- Furniture made for clients who provide blue prints of the product required, in which specific details are provided. This includes mainly architectural millwork for the hotel and construction industry.

2- Furniture made for clients who require any type of furniture, like dining tables, chest of drawers, office desks, or any household furniture.

- Standardize the type of chairs by group, to maximize the use of standard product components.
- Make full blue prints of the chairs to be manufactured.

- Make prototypes of the selected chairs, with a sample piece of every component, after the prototype has been analyzed and any errors have been corrected.

## Production System

Most Jamaican manufacturers depend on the worker to develop the way a product is going to be made. Consequently, the administration has very little control of the production process. (This is as a result of per-piece payment). In Ultramod, because of the multi-product production, a Production System is required that enables the administration to have control of the production at all times. This can be achieved only by dividing the Production Process into areas. In this way, any problem that may arise can be corrected before it causes any detrimental consequences.

Quality Control must be built into the Production Process.

Machine layout must ensure a continuous flow of the product components being manufactured.

The product must be engineered in such a way as to ensure the best use of the machinery and workers' skills.

Taking all this into consideration, the following are recommendations for the set up of the Production System:

- Divide the Production System into four areas, to have better Quality Control, to identify bottle-necks, to set up machine tasks more effectively, and to have a better control of the process:
  - 1- Rough Mill to ensure the quality and better use of the lumber.
  - 2- Machining to ensure control of the machine tasks, and to easily identify bottle-necks.
  - 2A- Set up a Machine Sanding Department to make sure all product components are machine sanded before being assembled. The workers in this Department must be hourly paid to ensure the quality required.
  - 3- Assembling so that the assemblers can act as quality controllers. Every product component that enters this area is to be inspected for quality before it is assembled. The Assembling Area provides better control of the product that is going to be finished.

4- Finishing. After assembling, all products are warehoused and finished as required.

- Assign a person to be in charge of Product Development, Product Engineering, and to monitor the Production Process.
- Set up the Rough Mill Area so that one person is responsible for preparing of all material for each product to be made. This will ensure that the lumber selected is of the quality desired, and reduce lumber waste.

**Note:**

At present the workers are paid per finished unit. To adjust to the new production layout, the unit payment must be divided in three areas

- Machining
- Assembling
- Finishing

Rough Mill and Machine Sanding should be paid by the hour

**Product Engineering**

Product engineering is the link between sales and manufacturing. Without a product engineering system in place, the product is manufactured without knowing how it is going to look until it is finished. Starting from the design, Product Engineering is the tool used to determine the amount of material that is going to be used, the type of construction and the way a product's components are going to be put together. Above all, Product Engineering determines how the machines are going to be used to perform the various tasks by which a piece of wood is transformed into a product component.

The success of a company depends on how much is known about how the product which is going to be produced when it is finished before the raw material enters the production system. In Ultramod, having a multi-product production, the key to increased productivity is to provide to the workers who are going to make the product detailed information on how the product is going to be made, so that they can concentrate on manufacturing it.

Following are the recommendations to set up the Product Engineering system:

- Employ a person to be trained to be in charge of the product engineering and development.
- Make full drawings of the parts or components of the different products to be manufactured to ensure the integrity of the designs.
- Standardize as much as possible the product components, specially in regards to whatever machining is to be done, so as to reduce machine utilization and increase production flow.
- Make a Route Sheet for each product component, mainly to provide a guide for each operation in the production process, and to establish each machine task.
- Make an extra sample of all the product components of all furniture for which repeat orders are expected so as to ensure quality control and eliminate hand fitting.

#### *Machine Utilization*

*The increase of production in a multi-product enterprise depends on the reduction of hand work, and how efficiently the machines are used, specially in regard to reduction of set-up time.*

*In Ultramod, there is an enormous amount of hand work put into the construction of the furniture being manufactured because of the lack of machinery, tools, and jig and fixture. Following are the recommendations to improve utilization of the machinery:*

- *Purchase a Table Saw with scoring blade to cut plywood, M. D. F., and melamine.*
- *Purchase a Edge Sanding Machine to reduce hand sanding and increase the quality of the finishing, specially in band saw product components.*
- *Purchase a heavy duty Shaper to facilitate the manufacturing of chair back legs, chair side rails, table tops and legs, doors and door frames, so as to increase production and improve overall quality.*

- Fix all existing machines that need repair, and purchase machine accessories such as sanding paper, bandsaw blades, shaper knives, router belts and saw blades.
- Set up table for Hand Router, to make it easier to use it.
- Make permanent set of jigs for the chair fronts and back legs, to reduce set up time in using the table saw, and speed up the changeover from working on one product to another.
- Make jigs for all chair back legs, to be used in the Spindle Shaper to ensure proper shape, and to minimize machine sanding.
- Identify common machine tasks and group them to reduce movement of components.
- Identify product components that are in regular use and group the machine tasks so as to reduce set up time.

#### Manufacturing Area

The manufacturing area must be divided according to the production process, especially when the area is relatively small. The Rough Mill Area is critical to an organized Production Process, because this is the area in which production is started and all the material for the product components is prepared. The rest of the Manufacturing Area must be divided taking into consideration the production flow or component movement. The Machine Sanding Area must be between the machining and assembling areas. The following are the recommendations to set up the Manufacturing Area:

- Make blue print of the factory with the machine layout in accordance with the Production Process.
- Set up small assembling table with corresponding assembling horses so that the table is used only for product components.
- Make shelving unit to store the product components that are awaiting assembly.

## Cleaning and Organization

The way the factory looks is a reflection of the Production System. If the Manufacturing Area is not clean and well organized, it is impossible to have organized production. The following are the recommendations for organizing the Manufacturing Area:

- Identify aisles for component movement.
- Cover all electrical boxes to protect from dust.
- Set up dust collector, specially for the Thicknesser and the Table Saw.
- Set up an area to store all Jigs and Fixtures, Saw Blades, Router Bits, Shaper Knives, and Bandsaw Blades.
- Make trucks in which to move product components, so as to prevent them from being scattered all over the floor. This will make the handling easier when the workers are processing them.

## Finishing Area

The Finishing Area has to be set up to facilitate the movement of the product being finished. Adequate dust extraction must be installed to eliminate the fall back of fumes on the products being finished. The finishing material must be selected so as to give the correct finish to each product. It is absolutely necessary for the air compressor and spraying system to be adequate to achieve a constant finishing application. The following are the recommendations to improve this Area:

- Set up a spray booth and dust extraction system.
- Upgrade the spraying system to improve the quality of the finishing.
- Ensure that the machine and hand sanding is done with the proper sanding paper, using heavy grid at the beginning and reducing proportionately until it reaches the final sanding required.

## TRAINING PROGRAM

Training is part of the Restructuring Program. To ensure the required results, the Training Program must be endorsed by the administration. It is most important that administration makes the commitment that any change put in place is going to be followed up to ensure continued progress.

- Set up a training program for the Product Engineering. To improve material use, improve construction method, and ensure the quality of the product. This includes training in:
  - Route Sheet Preparation
  - Material use
  - Construction method
  - Costing
  
- Set up training program for Machine Utilization. To reduce machine set up time, and improve the quality of the finished product. This includes training in:
  - Jigs and fixtures
  - Boring
  - Spindle Shaper
  - Machine sanding
  - Machine Task evaluation
  
- Set up training program for Production System. To identify bottlenecks, ensure quality control, and control of the production process. This includes training in:
  - Production Flow
  - Production Control

**RESTRUCTURING PROGRAM**

**CREATIVE KITCHEN**

*Report prepared by*

*Joel S. Suris*

*for*

**JAMPRO**

**AUGUST 8, 1992**

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## CREATIVE KITCHEN.

### 1. Introduction

Creative Kitchen has made financial contribution to support the Restructuring Program. This company main product is Kitchen Cabinet and Architectural Mill Work which supply their own construction company, including Flush Door, Panel Doors, and French Door and Windows.

### II. Company Evaluation

On July 23, 1992, Creative Kitchen was visited by Mr. Joel Suris, Technical Consultant, who made the preliminary evaluation of the company with a view to establish the process of restructuring the company's production system. There is a six-point evaluation to cover all phases of the company's present structure.

There are three areas where this company needs attention, these are:

- Machine Utilization, including machine upgrading and maintenance.
- Machine Layout.
- Production System.

#### II.A- Product line

With the exception of kitchen cabinet, this company product is mainly manufacturer to supply their own Construction Company. They have a specific line of product, which include:

- Kitchen Cabinet which consist of:
  - Approx. 40% for own Construction Company
  - Approx. 40% for other Construction Company
  - Approx. 20% for custom made cabinet
- Architectural Mill Work, including door frame and wood component use on their own project
- Panel Doors, French Doors and Windows

Except for Architectural Mill Work which most of it is custom made to specification, a great deal of standardization can be achieved in this company product line.

## II.B- Production System

Creative Kitchen has a system of production in place, but need to be improved to have full control of the production process.

At present orders are received and the Product Engineering department prepares the production order for the product to be manufactured, including drawing and the necessary cutting list. With the exception of custom made orders where one man is in charge of manufacturing the order from beginning to end, this is given to each department which has the following responsibilities:

- Panel Cutting:

This area is in charge of preparing all panel or press board material. The material is then sent to assemble all components which belong to the cabinet box, and to the cabinet top department, all component that belong to the top and to the door.

- Machining:

This area prepares all solid wood material for the cabinet component, which is then sent to the assembling department.

- Counter top:

This area is in charge of matching the material and gluing plastic laminate to top and doors, then send all finished components to the delivery department.

- Assembling:

The area assembles the cabinet front and box, glues and trims plastic laminate to cabinet front and sides if required.

- Finishing:

All cabinets that need finishing is done here.

- Delivery:

This area is in charge of installing drawer runners, door hinges, and cleaning and preparing cabinets for delivery.

Most of the supervisory work done at present, involves monitoring the work for quality and seeing that it is done in the time specified. However, everything depends on the ability of the workers themselves for the product output. Quality Control and other production measures are by verbal commitment only, since there is no system in place that monitors the production process.

Attention must be given to the fact that multi-product components are prepared in the same production area, and each component receive different amount of machine operation, which resold in a congested production flow.

Productivity and Quality is a reaction to a Production System in place. The Production System must provide an ease product flow throughout the production process, reduce time wasted when no value has being added to product component, and provide the worker with the system that enable them to identify mistakes, bottle necks and machine task sequences before the product component receives more work in it.

## II.C- Product Engineering

Product Engineering is the linkage between sales and the manufacturing of a product. Without this the product would be made with no knowledge of what the result will be until it has been made. Product Engineering affects:

- Design and styling of the product
- The material and how it is to be used
- The machine used to transform material into product component
- The construction method used to put product component together

Creative Kitchen have some product engineering system in place, but the system seems to be used only for administration purposes. Most of the actual engineering is done by the man who makes the product. In this company's multi-product production, the product engineer must take into consideration the different types of product component being manufactured and the different types of material being used, and develop the system to enable the worker to reduce machine task, machine set up time, assembling time, and most of all reduce the time a worker takes to make a product.

## II.D- Machine Utilization

Creative Kitchen have a considerable amount of machinery. These machinery have being purchased as needed to perform certain task in production. The machines are not used to increase output or to reduce labour input, but rather to provide service to factory workers. As the company grows, more workers enter the production process, therefore more machines are added.

- Ripping is done by hand pushing
- All joint detail are done mostly in the table saw

- No stop guide is set up in the machines, rather each one is marked by hand.
- Set off to size is done in the Radial Arm saw
- Cutter knife lacks sharpening
- Machines are poorly maintained
- The panel saw is under-used.

The following is a list of existing machinery and their condition:

**COUNTER TOP MACHINES**

	<i>Condition</i>
1- Under cut Panel Saw with scoring blade	<i>Needs overall</i>
1- Double side Shaper	<i>Needs upgrading</i>
1- Pinch Roller	<i>Needs overall</i>
1- Edge bending machine	<i>Needs upgrading</i>
1- Top bending machine	<i>Fair condition</i>

**PANEL CUTTING MACHINES**

1- Moving table panel saw w/scoring blade	<i>Needs S/blade</i>
1- Long arm radial saw	<i>Needs upgrading</i>
1- 4 head door boring machine	<i>good condition</i>
1- Double ends setup machine	<i>Needs overall</i>

**WOOD PROCESSING MACHINES**

1- Wide Belt Sander	<i>Fair condition</i>
1- Shaper 1 1/4 shaft	<i>Needs overall</i>
1- Double end Cross Cut	<i>Needs overall</i>
2- Stroke Sander	<i>Fair condition</i>
1- Spindle shaper 3/4 shaft	<i>Fair condition</i>
2- Table saw 10"	<i>Fair condition</i>
1- 8" joiner planer	<i>Fair condition</i>

1- 10" joiner planer	Fair condition
2- 16" thickness	Good condition
1- 16" top ripping saw	Fair condition
1- Overhead Router	Good condition
1- Compressor	Good condition
1- Tenoner	Fair condition
1- 14" Band saw	Needs cover
1- 14" Band saw	Needs cover

**MACHINE NOT IN USE**

- 1- Press
- 1- 3 bag dust collector
- 1- 3 section panel press
- 1- Stroke sander
- 1- Halz Hers edge banding machine
- 1- Interwood dove-tail machine

**II.E- Manufacturing Area**

The total building area is \_\_\_\_\_ s.f. which is divided as follow:

Manufacturing area .....	_____	s.f.
Lumber stack area.....	_____	"
Finishing area .....	_____	"
Office and Administration.....	_____	"

The manufacturing area is not divided properly, taking into consideration the production process, but rather it is organized by selecting an area where machines are concentrated to minimize the moving of components, which means that half of the manufacturing area is used for component processing and the other half is used for assembly. There is a lot of un-used machines lying around; it is considered that only 60% of the manufacturing area is in use.

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## II.F- Cleaning and Organization

Cleaning up, keeping everything (machinery, entire working areas, etc.) clean at all times is not given sufficient attention. There is a lot of old part, and wood not in use lying around.

- To many un-used machines in the production area
- No dust collection system in place
- Back area congested with material

## II.G Finishing Area.

There are two spray booths in the factory, one is used for finishing and the other is used for contact cement application. Both systems need to be overall.

The product being manufactured mainly require sanding sealer, clear lacquer, and primer and colored lacquer.

- All spraying is done using cup-gun
- No filter is installed in systems
- No revolving table are in place

### RECOMMENDATIONS FOR RESTRUCTURING CREATIVE KITCHEN.

Creative Kitchen have the potential to supply a good portion of the kitchen cabinet for the local market, taking this into consideration, the following are recommendations to be reviewed by the Management. The recommendations have been developed taking into consideration the company's size, products manufactured and the constraints of this enterprise.

Productivity is a reaction to a Production System in place, which includes all the necessary tools, for eg. adequate machinery and accessories, good product engineering, good manufacturing processes, production flow, and production control will result in higher productivity. This means that the factory workers are productive not because they work harder, but rather they are responding to the system in place that guides them. In Creative Kitchen some of these requirements are missing, therefore increases in productivity and product quality are measured against previous experience, which is a reflection of the workers' performance, not an improvement of the system. To overcome this problem, this enterprise must be restructured taking into consideration all the areas analyzed previously.

## Product line

Most kitchen require typical cabinet like sink-cabinet, stove-cabinet, and oven-cabinet, the rest is filled up with different size cabinets including drawers-cabinet, shelves-cabinet, broom-cabinet. Furthermore, the look of the cabinet front is a focal point of the kitchen.

It is recommended for this company to continue with the present product, but make the following adjustment:

- Standardize the size of the cabinet to reduce the amount of door size as follows:

12" Door cabinet	18" Drawer cabinet
24" Door cabinet	36" Sink cabinet
18" two section broom cabinet	30" three section oven cabinet

= Design a kitchen with oven and stove cabinet, to improve marketing

- Design a kitchen using oak lumber for the front.

## Production System

Most Jamaican manufacturers depend on the workers to develop the way a product is going to be made. Consequently, the administration has very little control over the production process. (This is as a result of piece work payment.) In Creative Kitchen, because of the multi-product production, a Production System is required that enables the administration to have control of the production at all times. This can be achieved only by dividing the Production Process into areas. In this way, any problem that may arise can be corrected before it causes any detrimental consequence. Quality Control must be built into the Production Process. Machine layout must ensure a continuous flow of the product components being manufactured. The product must be engineered in such a way as to ensure the best use of the machinery and workers' skills. Taking all this into consideration, the following are recommendations for the set up of the Production System:

- Divide the Production System into four areas, to have better Quality Control, to identify bottle-necks, to set up machine tasks more effectively, and to have a better control of the process:

1- Rough Mill to ensure the quality and better use of the lumber, and easily set up priority for the product being manufactured.

- 2- Matching to ensure control of the machine tasks, and to easily identify bottle-necks, set up machine task unit, and easily set up component flow.
- 3- Assembling so that the assemblers can act as quality controllers. Every product component that enters this area is to be inspected for quality before it is assembled. The Assembling Area provides better control of the product that is going to be finished.
- 4- Finishing. After assembling, all products are warehoused and finished as required.
- Set up the Rough Mill Area so that one person is responsible for preparing all materials for each product to be made. This will ensure that the lumber selected is of the quality desired, and reduce lumber waste.

### Product Engineering

Product engineering is the link between sales and manufacturing. Without a product engineering system in place, the product is manufactured without knowing how it is going to look until it is finished. Starting from the design, Product Engineering is the tool used to determine the amount of material that is going to be used, the type of construction and the way a product's components are going to be put together. Above all, Product Engineering determines how the machines are going to be used to perform the various tasks by which a piece of wood is transformed into a product component.

The success of a company depends on how much is known about how the product will be produced before the raw material enters the production system. Creative Kitchen has a multi-product production, the key to increased productivity is to provide workers with detailed information on how the product is to be made, so that they can concentrate on manufacturing it.

The following are recommendations to set up the Product Engineering System:

- Standardize as much as possible the product components, specially in regards to whatever machining is to be done, so as to reduce machine utilization and increase production flow.
- Make a Route Sheet for each product component, mainly to provide a guide for each operation in the production process, and to establish each machine task.

- Make an extra sample of all the product components for which repeat orders are expected, so as to ensure quality control and eliminate hand fitting.
- Change the mortise to dowel joint to increase the output, to reduced the time it takes to perform this operation.
- Standardize all cabinet front frame to reduce construction time, grove the assembled frame for side and baton to facilitate the assembling, this will allow installation of the door before the cabinet is assembled.

### Machine Utilization

The increase of production in a multi-product enterprise depends on the reduction of hand work, and how efficiently the machines are used, especially in regard to reduction of set-up time. In Creative Kitchen, lots of extra work is put into the product being manufactured. Specifically in the kitchen front, and when manufacturing door and windows component.

Following are some door component description to highlight the simplicity of it:

#### 8 panel door component

2 styles

1 top

Require 16 lineal feet of the same shape molded wood

3 crosspieces

4 upright

Require 12 lineal feet of the same shape molded wood

1 bottom

Require 2 lineal feet of molded wood

8 panels

require 10 lineal feet of molded wood

#### French door component

2 styles

1 top

Require 16 lineal feet of the same shape molded wood

3 crosspieces

4 upright

Require 17 lineal feet of the same shape molded wood

1 door bottom

Require 2 lineal feet of molded wood

There are eight (8) typical operations or tasks performed on any product component regardless of the product being made. The easier and most efficient way that the tasks are performed the faster the product component flow through the production process. The quality of the product depend on the means by which the task is performed. Following are the operations:

<u>Operation</u>	<u>Machine</u>
THICKNESSING/PLANNING	Edge planing Thicknesser
ROUGH CUTTING	Radial Arm Saw Air Cross Cut
STRAIGHT RIPPING	Table Saw Push by hand Table Saw with feeder Straight Line Rip Saw
IRREGULAR RIPPING	Electric Jig Saw Band Saw
CUT TO SIZE	Table Saw Double end Set Off Saw
EDGE SHAPING	Hand Router Overhead Router Spindle Shaper Molder
SURFACE SANDING	Electric Hand Sanding Edge Sanding Wide Belt Sanding
JOINTING PART	Mortise and Tennonner Boring

The woodworking machines are designed according to the task they perform and the output required. According to the output required there are other sophisticated machines not including in this report.

Taking the above into consideration, following are the recommendations to improve utilization of the machinery:

- Set up a maintenance department and train a person to have the sole responsibility to keep the machines in working condition.
- Purchase some sharpening equipment and grinding tools
- Purchase a boring Machine to make the jointing of product components easier.
- Make evaluation of each machine upgrading need
- Set up jig and fixture to minimize set up time and hand fitting
- Set up a fix three spindle shaper to make cabinet door component to eliminate set up time

### Manufacturing Area

The manufacturing area must be divided according to the Production System.

The Rough Mill Area is critical to an organized Production Process, because this is the area in which production is started and all the material for the product components is prepared. In this are the material will be:

- Cut to rough size
- Rip to width
- Mould if a molder is in place. Thickneser to the width and thickens

The rest of the Manufacturing Area must be divided taking into consideration the production flow or component movement. The Machine Sanding Area must be between the machining and assembling areas.

The following are the recommendations to set up the Manufacturing Area:

- Make blue print of the factory with the machine layout in accordance with the Production Process.
- Set up the Rough Mill area where the panel saw machines is at present.
- Mauve the Machining area where the rip saw is at present
- Set up small assembling table with corresponding assembling horses so that the table is used only for product components.

- Make shelving unit to store the product components that are awaiting assembly.

#### Cleaning and Organizing

The way the factory looks is a reflection of the Production System. If the Manufacturing Area is not clean and well organized, it is impossible to have organized production. The following are the recommendations for organizing the Manufacturing Area:

- Identify aisles for components movement.
- Set up an area to store all Jigs and Fixtures, Saw Blades, Router Bits, Shaper Knives, and Bandsaw Blades.
- Make trucks in which to move product components, so as to prevent them from being scattered all over the floor. This will make the handling easier when the workers are processing them.

#### Finishing Area

The Finishing Area has to be set up to facilitate the movement of the product being finished. Adequate dust extraction must be installed to eliminate the fall back of fumes on the products being finished. The finishing material must be selected so as to give the correct finish to each product. It is absolutely necessary for the air compressor and spraying system to be adequate to achieve a constant finishing application. The following are the recommendations to improve this Area:

- Upgrade the spray booth and dust extraction system.
- Change the contact cement spray booth into a finishing booth
- Instal 3 galons pot with house and spray gun for each of the standar finiching material
- Ensure that the machine and hand sanding is done with the proper sanding paper, using heavy grid at the beginning and reducing proportionately until it reaches the final sanding required.

#### TRAINING PROGRAMME

Training is part of the Restructuring Programme. To ensure the required results, the Training Programme must be endorsed by the

administration. It is most important that the administration make the commitment that any change put in place is going to be followed up to ensure continued progress.

- Set up a training programme for the Product Engineering. To improve material use, improve construction method and ensure the quality of the product. This includes training in:
  - Route Sheet Preparation
  - Material use
  - Construction method
  
- Set up training programme for Machine Utilization. To reduce machine set up time and improve the quality of the finished product. This includes training in:
  - Jigs and fixtures
  - Boring
  - Spindle Shaper
  - Machine sanding
  - Machine Task evaluation
  
- Set up training programme for Production System. To identify bottle necks, ensure quality control, and control of the production process. This includes training in:
  - Production Flow
  - production control

**TRAINING PROGRAM  
for  
CREATIVE KITCHEN**

**MARKETING**

- Measurement
- Design and layout
- Delivered time

**PRODUCT STANDARDIZATION**

- Type of standardization
- Benefit in standardization

**PRODUCT ENGINEERING**

- Material selection
- Production order development
- Production process development

**PRODUCTION SYSTEM**

- Rough mill area
- Machining area
- Preform section
- Assembling area

**STANDARDIZATION OF PRODUCT LINE**

EVERY KITCHEN SHOULD BE CUSTOMIZE TO THE CLIENT NEEDS. Therefore the perception then is, that the client determine the way the kitchen is made. This is the way Creative Kitchen is being manufacturing their product, resulting that no two kitchen are manufacturing alike, therefor must of the kitchen made by this company are being built fitting every piece from beginning to end, resulting that

- Component can not be manufacturing independently from one to another
- Door can not be made at the same with the rest of the cabinet parts or component.
- The men need to partially assembled some components in order to be able to identify the others.
- Cabinet parts can not be store until they are ready to be assembled.

To eliminate this problem the answer is to manufacture the same selected size cabinet all the time so that they can be use in any kitchen require by this company costumer. Must kitchen regardless of the size are a continuation of cabinet one beside the other and the only visible area of the cabinet is the front. Therefor all cabinet should be standardize that the same cabinet can be use for different kitchen and to achieve it cabinet must be made using sizes that putting them together one can fill any size of kitchen

There are two guide line to determine the size of the cabinet to be manufactured

- The accessory that are install in it which always require an standard size of cabinet, like 3'-0" for the sink, 2'-6" tall cabinet for wall oven, 1'-6" for drawers, and 2'-6" space for floor stove.
- The size of the cabinet so that by combining them any size of kitchen ca be made.

Normally the standard size for kitchen cabinet are as follow

- 1'-6" three drawer cabinet
- 2'-0" two door cabinet
- 2'-6" two door cabinet
- 2'-9" two door cabinet
- 3'-0" two door cabinet

Therefor the kitchen that needs 10'-3" of cabinet it has a drawer section and a sink is require can be made using:

- 1- 3'-0 two door cabinet for the sink
- 1- 3'-0 two door cabinet
- 1- 1'-6" three drawer cabinet
- 1- 2'-9" two door cabinet

There are two type of standardization, the standardization of procedure and the standardization of product and product component

**STANDARDIZATION OF PROCEDURE:** It means that order are always ensue the same way, production controls and others measurement to ensure the smooth running of product through the production process

are always provide that it become a patent of action so it is easier to identified any deviation from it, this eliminate or reduce the communication misunderstanding with the costumer and with the factories workers

- Prototype of front, side, baton doors, drawer etc for each side of cabinet must be made, so that workers make the component, exactly as the sample to ensure occurrence instead of following measurement which can be a reason for mistake
- Order of production are always issue the same way so become a patten of communication and when is not done so it create a reaction which provide an insurance to reduce mistake.
- Costumer must be informed how the kitchen is going to be manufactured including material, size of shelve, construction method, etc. to ensure a clear understanding with the costumer
- Costumer should be inform how the kitchen is going to be lay out to identified the cabinet selection to be provided.
- Costumer should not be allowed to determine the way the kitchen is going to be manufactured, that any change require must have a satisfactory reason.

Do not encourage the costumer to install water hitter in the corner, use a 24" cabinet space and install a removable front with doors, this will make life easier for every body.

**STANDARDIZATION OF PRODUCT OR PRODUCT COMPONENT:** This area is control by the product engineering which is the way the product is going to be manufacturer using the must efficient way. The product standardization is has been explain previously using the cabinet selection the next step is to standardize the product component, there are two type of component standardization, one is as component itself and the other is as a group of assembled component or unit:

- Side frame or side panel are the same for every cabinet
- Base cabinets with doors and upper drawers is the same as cabinets with full doors, except for the front cross rail.

- Door for standard 24 3/4" height wall cabinet it is the same size as the door for the base cabinet with upper drawer.
- 18" wide base cabinet it is always the three drawer cabinet.
- 36" wide base cabinet it is always use for the sink cabinet.
- Tall storage cabinet should always be the size that if it is require a wall oven can be install in it.
- Broom cabinet should be always 18" wide
- Do not manufacture a corner cabinet, a cabinet bottom with base. it is the only thing needed.
- Plastic laminate for the cabinet front frame must be glue to the wide wood pieces before is rip to the require with (this require a different system of assembling the front frame)

The above standardization provide the following:

1. Cutting list is reduce to:

- Base cabinet side frame, multiply by amount of cabinet require
- Wall cabinet side panel, multiply by amount of cabinet require
- Front frame side rail, multiply by amount of cabinet require.
- Top and button rail for the front frame of the base cabinet is the same as cabinet upper back rail.
- Door side are reduce to 5 different with in which doors can be made in 8'-0" long panel and cut to the require length after laminate it is glued and trim, following is listed:

9 3/8" X 29" for the 24" base cabinet  
 12 3/8" X 29" for the 30" base cabinet  
 13 7/8" X 29" for the 33" base cabinet  
 16 3/8" X 29" for the 36" base cabinet

18 1/2" X 22" for the 18" wall cabinet  
 9 3/8" x 22 1/4" for the 24" wall cabinet

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12 3/8" X 22 1/4" for the 30" wall cabinet  
13 7/8" X 22 1/4" for the 33" wall cabinet  
16 3/8" X 22 1/4" for the 36" wall cabinet

2. Cabinet can be processes and stored in part until are ready to be delivered which is the time to assembled

### PRODUCT ENGINEERING

Product engineering is the leakage bitewing sale and manufacturing, product engineering affect the following areas of the production process:

- Design and how the product look is affecting the production process.
- Material and how is going to be use.
- Construction and the method use to joint the component.
- Machine utilization and how the material it is transformed from a piece of wood to a product component.

#### Production order development:

After the cabinet are being standardize to a fewer sizes, the next step in the process is to standardize the product component. To achieve this there are two type of product component, one is the product component itself, and the other is the product component as a group or unit.

To make the production process easier the cabinet must be divided in unit that can be use in any size cabinet

- Side panel are always the same, whether it is a frame when open side are require, or plywood when close side are request.
- Drawers always are the same because the drawer cabinet is always the same size.
- Side and center rail in the front frame is always the same.

#### Production process development:

This mean how the cabinets are going to be manufacture, how the component are going to be put together. The total concept of the production process is to manufacture a product using the must

efficient and easier way always trying to eliminate hand fitting of product component, reduce the use of had work, the control of quality which is achieve by eliminating the possibility of a mistake.

### PRODUCTION SYSTEM

Why standardize the product or product component, what is the reason for it. There are three reason

- 1 Manufacture the same cabinet all the time, this will eliminate error and make the layout of kitchen simple
- 2 Reduce amount of different sizes component parts, this will increase production because is less amount of machine change over.
- 3 Ensure to maintain good quality, speed delivered, and provide better production management by reducing the customizing of production procedures for every customer.

To manege the production order been manufacturer through the production process, there is the need to have in place the production system that enable administration to have the controls require to efficiently supervise the production

For example if in any typical month the company have to manufacture six complete kitchen and this kitchen require the following cabinet

6 @ 36" sink cabinet  
8 @ 18" three drawer cabinet  
13 @ 24" cabinet  
10 @ 30" cabinet  
12 @ 33" cabinet

To manufacturing the above cabinet the production should be as fallow:

### CUTTING LIST

#### SOLID LUMBER PINE

196	Side frame side rail	3/4 x 1 3/4 x 29 3/4
302	" " cross pieces	3/4 x 1 3/4 x 19 1/4
96	Front frame side rail	3/4 x 1 3/4 x 31 1/2
49	" " upright	3/4 x 1 3/4 x 28

12	"	"	top/	Button	3/4 x 1 3/4 x 32 1/2
32	"	"	"	"	3/4 x 1 3/4 x 14 1/2
26	"	"	"	"	3/4 x 1 3/4 x 20 1/2
20	"	"	"	"	3/4 x 1 3/4 x 26 1/2
24	"	"	"	"	3/4 x 1 3/4 x 29 1/2
6	Cabinet	back	rail		3/4 x 1 3/4 x 32 1/2
8	"	"	"	"	3/4 x 1 3/4 x 14 1/2
13	"	"	"	"	3/4 x 1 3/4 x 20 1/2
10	"	"	"	"	3/4 x 1 3/4 x 26 1/2
12	"	"	"	"	3/4 x 1 3/4 x 29 1/2

#### PLYWOOD

6	Plywood	button	for	36" cabinet	1/2 x 22 3/4 x 36
8	"	"	"	18" "	1/2 x 22 3/4 x 18
13	"	"	"	24" "	1/2 x 22 3/4 x 24
10	"	"	"	30" "	1/2 x 22 3/4 x 30
12	"	"	"	33" "	1/2 x 22 3/4 x 33
12	Plywood	doors	for	36" cabinet	1/2 x 16 3/8 x 29
26	"	"	"	24" "	1/2 x 9 3/8 x 29
20	"	"	"	30" "	1/2 x 12 3/8 x 29
24	"	"	"	33" "	1/2 x 13 7/8 x 29
8	Drawer	front	for	18" cabinet	1/2 x 15 1/2 x 6
8	"	"	"	18" "	1/2 x 15 1/2 x 7 1/2
8	"	"	"	18" "	1/2 x 15 1/2 x 14

#### ROUGH MILL PRODUCTION METHODS

In this department the only action apply to the material is as describe bellow:

##### Solid wood material:

- 1 Thickness to the thick desire if it is needed.
- 2 Cut to 1" oversize rough length
- 3 Join edges for ripping
- 4 Rip to the different with require

##### Plywood material:

- 1 Rip to the with desire
- 2 Cut to the length desire

##### Note:

Pine lumber can be prepare two ways

- 1 Lumber stack is cross cut to 1" oversize and them rip to 1 3/4 with
- 2 Lumber stack is rip 1 3/4 with as it is purchased and them cut to the final length require ( this

procedure will increase the ripping action and eliminate the set off to the final length action )

Plywood can be prepare as fallow

- 1 All cabinet button can be rip to 22 3/4 by the plywood length them cut to the final length at the machine department.
- 2 All door material can be rip to the different size require, send them through the door machine install the laminate and them cut to the final length.
- 3 All drawer material can be rip to 15 1/2" with send them through the door machine install the laminate and them cut to the final length.

In this department after all the material has been prepare it is distributed as fallow:

All solid wood material is send to the machine department to proceed preparing them.

All plywood button material is send to the machine department to proceed preparing them.

All doors and drawer material is send to the door machine to round the edges install the laminate, and if needed it is sent to the machine department to be cut to the final length.

Machine requirement

- Thicknesser
- Joiner
- Radial arm saw
- Table saw
- Panel saw

#### MACHINING DEPARTMENT PRODUCTION PROCESS

In this department the actions apply to the cabinet components are as fallow:

All components when it is cut to the final length should be verified with existing prototype to ensure accuracy

Cabinet front frame  
all components

- 1 Cut to the final length
- 2 Make grove on all side rail and on button rail for assembling

Cabinet side frame  
cross rails

1 Cut to final length

Side rails

1 Cut to final length  
2 Make tenon on 1/2 of the  
rail for assembling.

Cabinet button

1 Cut to final length if require  
2 Make tenon for assembling

Cabinet back rail

1 Cut to final length

Machine requirement

- Panel saw
- Table saw
- Spindle shaper
- Overhead router
- Small thicknesser
- Joiner
- Edge sanding
- Struck sanding
- Boring machine

#### PREFORM SECTION PRODUCTION PROCESS

In this department the actions apply to the cabinet components are as follow:

All components when it is cut to the final length should be verified with existing prototype to ensure accuracy

Cabinet doors and drawers

- 1 Round edges
- 2 Apply contact cement
- 3 Join laminate and plywood
- 4 Run trough press
- 5 Bend edges
- 6 Trim excess laminate
- 7 Cut to final length
- 8 Bore hole for hinges if needed

Counter top

- 1 Round edges
- 2 Apply contact cement
- 3 Join laminate and plywood
- 4 Run trough press
- 5 Bend edges
- 6 Trim excess laminate

- 7 Rip for back slash
- 8 Bend back slash
- 9 Cut to final length

**Machine requirement**

- Preform machine double edge shaper
- Contact cement spraying system
- Pinch roller
- Preform machine laminate bending
- Counter to bending machine
- Door hinge boring machine
- Counter to set off machine

Carolyn Rowe  
Heart  
Kingston Jamaica

Dear Mrs. Rowe

Enclosed please find recommendations for upgrading the furniture manufacturing skill. In the near future I will provide a detailed report for the community woodworking facilities.

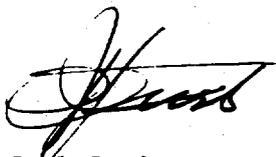
Heart, as a training institution can influence a great deal the upgrading of the furniture industry in Jamaica, resulting in a more competitive product.

At present there are fundamental problems in the furniture industry in Jamaica:

- Lack of product engineering, resulting in factories depending on the workers' interpretation of the product to designing the way the product is going to be made.
- Lack of production management, With the result that productivity and organization of the production process are decided by the workers.

At present Heart is providing basic training for woodworking skills and basic machine use. Graduates of these programs have very little impact in terms of improving the local furniture industry. However the Heart organization does have a drafting school, and this is the first step in a product engineering program. In addition the woodwork shop should be upgraded to provide students with the skill to use machines in their work. This would eventually lead to increased productivity by reducing the present reliance on hand work.

Your truly



Joël Suris  
Furniture Consultant

TO: Carolin Rowe

FROM: Joel Suris

SUBJECT: Recommendation to upgrade furniture manufacturing skill

DATE: November 5, 1992

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The restructuring of the furniture industry in Jamaica requires fundamental changes in crucial aspect of operation including:

- Upgrading of equipment
- Machine maintenance and preventing program
- Thoroughly designed production systems
- Proper product development and engineering
- The design of jigs and fixtures to reduce set-up time and improve productivity

When this aspect are institutionalized the operation become dependent on the efficiencies of the system rather that the workers which at present is the problem facing must of the factory.

Must factories are set up primitively merely utilizing machines which fulfil the basic need in wood processing and at the same time ignoring the high hand labor input require. Such operation depend on the factory worker for quality, product development and engineering, and machine maintenance. With the limited technical knowledge of the majority of the workers the usual result is low quality and productivity.

To mitigate these pitfalls in the existing organizations training must be focussed on two distinct groups:

- The workers who produce the product
- The management who control the system

The training for workers would emphasize:

- A The use of jig and fixture to reduce set up time and eliminate hand fitting.
- B Machine utilization to increase the flow of component and reduce bottle-necks.
- C Machine maintenance to ensure continuity in the use of machines.

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- D Product engineering to develop skills in machine utilization.
- E Pre finish surface preparation to improve the quality of the finish product.
- F Quality control as part of the production process to reduce rejects and ensure acceptability of the product.

On the other hand training of management would emphasize:

- A Production system design which include route sheets, machine-layout, and identification of bottle-necks to facilitate efficiency in systems.
- B Product develop and engineering including designing, drafting and blueprinting of products to determine all input necessary and their efficient usage.
- C Machine utilization for selection of appropriate machines to be used in the production processes.

To meet this need the following are recommended

- 1- Hands-on technical training for production management personnel to develop system skills.
- 2- Hands-on technical training for workers to develop production skills.
- 3- Short-term technical assistance to furniture company directors and managers in financial management with emphasis on projecting the effects of the restructuring program to facilitate the financing, boost internally and internally of major implementation cases.
- 4- On a micro basis it is recommended that some facility be set-up with appropriate machines under the auspices of Heart in communities where mini-entrepreneurs are making furniture using hand methods. These manufacturers can then be concentrating in one factory and rent the use of the machinery while they are receiving training in manufacturing skills with the commitment that this facility can be purchased by them, on completion of training.
- 5- Develop some Heart drafting school student in to product engineer and product developed to reduce the use of factory worker perform a job in which they are not trained for.