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ASSISTANCE IN THE ESTABLISHMENT  
OF A PILOT FURNITURE PLANT

DP/DRK/86/011

THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

Technical report: Training manual on production  
organization and work preparation\*

Prepared for the Government of the Democratic People's Republic of Korea  
by the United Nations Industrial Development Organization,  
acting as executing agency for the United Nations Development Programme

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\* This document has not been edited

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## PREFACE

This training manual is one of a series prepared by a UNIDO expert while serving as Chief Technical Adviser on a UNDP financed and UNIDO executed project in the People's Democratic Republic of Korea to establish a Pilot Furniture Plant (project number DP/DRK/86/011). The complete series can be used to train the personnel of other factories.

These manuals were written to achieve two major goals: first, to give trainees a broader view of an industrial system, and, second, to serve as a practical guide to machine operators and assemblers, thus enabling them to better perform their duties.

A particular attention has been devoted to materials and their correct utilization, to the design and quality of products, to the organization of the work areas and to safety measures.

Concerning the organization of production, an attempt has been made to incorporate the organization of the Pilot Furniture Plant into the organizational structure of the Pyongyang Wood Processing Complex, taking into account the specific internal organization of the pilot plant.

The entire scope of the training envisaged to be given, with the intended audience for each topic is given in Annex I.

The syllabus, namely the topics, the duration of lectures (theory) and practical work and the level of competence attained after completion of the course on this topic is given in Annex II.

## INTRODUCTION

This document covers the organization and work preparation procedures in the Pilot Furniture Plant. Good organization is a prerequisite of efficient production. It is most important that all the personnel of the factory understand the organizational system and its functions. Work preparation is part of the organizational system. It ensures production with the most suitable tools and equipment, using appropriate materials and methods within standard times.

Since the human factor plays the most important role in any organization, it is essential that the factory's personnel understand and accept the organizational system and that they feel that they are the subjects and not the objects of the organization.

### 1. Types of furniture production

There are three basic types of production: single, serial (small, medium and large series), and mass production (see Fig. 1).

The production of single items is the oldest type of manufacturing and is particular to artisans. Production in series, either small or large is common in the furniture industry. production in large series is a continuous process, while production in small series is a batch process.

Mass production is the most efficient and effective type from the economic point of view. Workers are highly specialized for certain operations, resulting in high productivity and good quality.

Production in large series is less specialized, but is based on standardized programmes with interchangeable parts. Higher skills are required from the workers, and the machinery should be adjustable to the production process of various products.

Small or medium size factories produce medium size series. The equipment is mostly universal woodworking machines. If well organized, this type of production can achieve a satisfactory level of productivity and quality.

Production in small series is the interface between handicraft and industrial production. The rationalization of the production of single products is attempted to satisfy increased demand of certain goods.

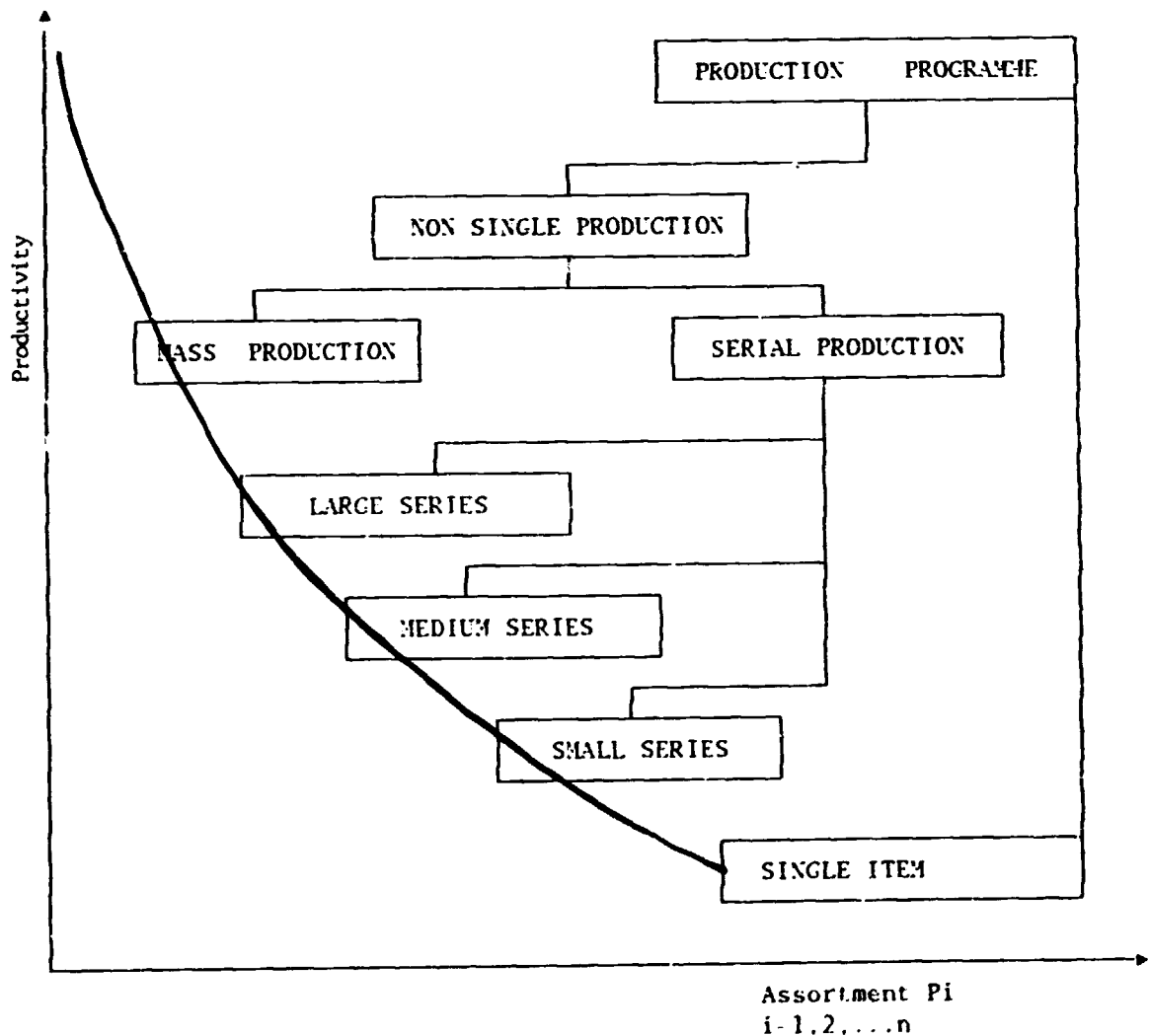


Fig. 1: Types of product lines and production.

Producing single items of furniture is a typically artisanal way of production. In industry it is only used to produce prototypes for new products. It requires universally skilled craftsmen, is the least productive and therefore the most expensive type of production.

The level of mechanization and automation depends, to a large extent, on the type of production. The change from small to medium and large series production calls for a higher degree of automation, mechanization and the installation of conveyor systems.

The level of technology ranges from the hand tools stage to the fully mechanized stage. Usually, handicraft shops use basic woodworking machines for the production of a single piece or to produce in small series. The equipment is commonly used as tools rather than as industrial machines. These shops accept orders for any type and design of furniture in small quantities. The quality level of the products usually reflects the minimal quality demand of the domestic market. The timber is not properly dried in a kiln. The joints and surfaces of the components are rough and generally show a low grade of workmanship. The maintenance of machinery and tools is poor. Machine set-up is inaccurate. Jigs are rarely used. All the above points cause low precision of machine work, and the workers tend to do their work with hand tools. There are no standards nor interchangeable parts: this is the result of inappropriate design and bad work preparation. The layout of the machines is inappropriate, internal transport and production techniques are inadequate, resulting in low productivity and high production costs.

Industrial production has a systematic approach to all components of a production system. It is based on product specialization and serial production of selected products. A basic prerequisite for industrial production is an adequate knowledge of the products and of the production system as a whole. Accepting industrial production is more than having sophisticated machinery. Industrial production is very complex, and, to be successful, all factors have to be taken into consideration and carried out. Hereunder is a list of the most important ones:

- Design and construction of furniture for industrial production with the use of standards, interchangeable parts and industrial methods of production;
- Work preparation, including materials, tools, jigs, production information and cost calculation.
- Effective organization of production and internal transport with a proper layout of machines and other facilities.
- High quality of maintenance and repair enabling the factory to constantly produce at the required level of quantity and quality.
- Quality control to assure quality standards which meet the criteria of the customers
- Better trained and higher skills of workers (machine operators and machinery maintenance personnel) to use a higher level of technology and more sophisticated equipment.

- Permanent work on product development towards knock-down furniture production systems, dowel construction and work with production tolerances.
- Higher level of tool maintenance, construction and machining of jigs and fixtures.
- Higher level of integration of furniture production with primary wood processing thus ensuring a permanent supply of sawwood, veneer, plywood, particle board etc.
- Adequate quality of raw materials and proper machining, sanding, finishing and packing of products.
- Adequate supply of auxiliary materials such as glues, abrasives, finishing materials, metal components etc.
- Active, technically minded and industry-oriented management in order to attain a level of industrial technology appropriate to the existing conditions.

Due to the above factors, the productivity and quality of the products are much higher than in the handicraft production of furniture. The table hereunder compares some basic characteristics of handicraft and industrial production.

PRODUCTION FACTORS	HANDICRAFT PRODUCTION	INDUSTRIAL PRODUCTION
Type of production	Single pieces or in small series	Medium or large series
Product line	Accepts all designs and all quantities	Limited number of selected products
Machinery	Universal machines used as mechanized tools	Specialized and more sophisticated machinery
Factory layout	Groups of related machines	Production lines with production flow
Maintenance of machinery	Poor and only when needed	Planned preventive maintenance
Tool maintenance	Poor	Well organized and good
Jigs and fixtures	Rarely used	Used regularly
Work preparation	Informal	Inevitable, compulsory
Product development	Accidental	Systematic
Skills of workers	Universal and low	Specialized and high
Standardization	Does not exist	Standardized production and interchangeable parts

PRODUCTION FACTORS	HANDICRAFT PRODUCTION	INDUSTRIAL PRODUCTION
Quality control	From time to time	Permanent
Quality of products	Poor - unless done by highly skilled craftsmen (who are rare)	In accordance with international standards
Production organization	Simple, ineffective	Complex but effective
Productivity	Low	Several times higher
Management	Based on experience	Based on knowledge and information systems
Production costs	Out of control	Under permanent control
Training of labourers	No formal training	Permanent training is part of the system of industrial production

## 2. The production system: its establishment and maintenance.

The production system is a regular interaction of independent groups of different activities leading to a coordinated production. It is the basis for the unity of the relationship between complex managerial problems.

The system's components are unified by common goals. A change in one of the system's variables may affect many others. For example, a change in the rate of production may affect inventories, materials supply, transportation etc. The system approach is very helpful in solving complex problems and evaluating their effects. In defining a specific system, boundaries are drawn, so that each part of the system can be examined separately. Each part is considered a system in itself, thus most systems can be broken down into smaller systems or sub-systems. A basic element of any system is the feed-back control loop (see Fig. 2 below). How the system responds to control depends on how long it takes between sensing a mistake and corrective action being taken and on the sensitivity of the system as a whole. The sensitivity depends on the organization's efficiency.

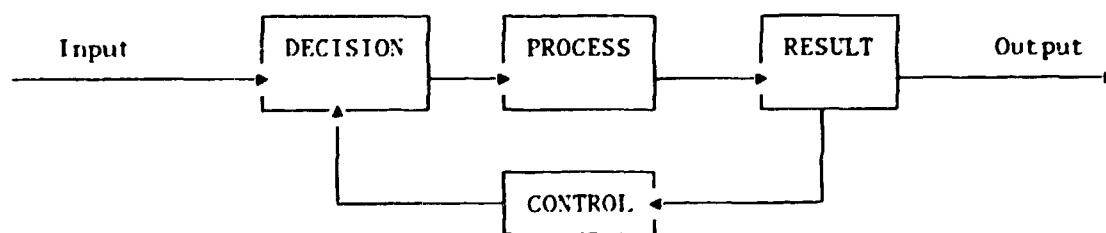


Fig. 2: A feed-back control loop as a basic element of a system.



Different from the feed-back or the so-called "closed" system is the "open" system where the outputs are isolated and have no influence on the inputs. The functions of the operation might be represented by a complex network of processes, where each sub-system has its own inputs and outputs. Inputs flowing from outside the system's boundaries (such as those for labour, energy, materials, equipment, external services, financial resources etc.) are particularly important to the system, since these are routing data from operations and are the basis of many decisions.

The possibility of optimization is one of the most important features of a system. The optimal output of the system is not the simple sum of partial optimums of the sub-systems. It follows that the lower systems have to follow the optimum of the higher ones. The system approach enables companies to use computers and various analytical methods in production and management operations. In the system, there are controllable and uncontrollable variables. Controllable variables are those which can be manipulated by management, e.g. the production programme, production methods, size of a series etc. Uncontrollable variables are those which are imposed by the environment, e.g. customer demand, wage rates, various government regulations etc.

The Pilot Furniture Plant should be developed into an efficient production system, easily controllable and manageable. To establish a production system means to design an organization and information system approach. The boundaries of a system have to be drawn, inputs and outputs defined and the feed-back control loop introduced.

### 3. Production organization for manufacturing case furniture.

An organization is a structure of resource utilization established to meet a system's objectives. The purpose of organizing is to enable the resources to work more effectively as units. An organization has a unity of command which is based on the idea that no one can do an effective job if conflicting directives are given.

The organization is usually represented by an organizational chart indicating how the work is broken down into various sections and functions, showing how employees are to work together, identifying job positions and names of individuals assigned to perform specific duties, and showing relationships among levels of authority and channels of communication. The key question is how to get individuals to perform the right action at the right time.

To establish an organization for manufacturing case furniture means creating such a relationship and interaction of the basic production elements enabling the production of a certain quantity of furniture at an adequate consumption value. The basic production elements are: human work, objectives and working facilities (see Fig. 3).

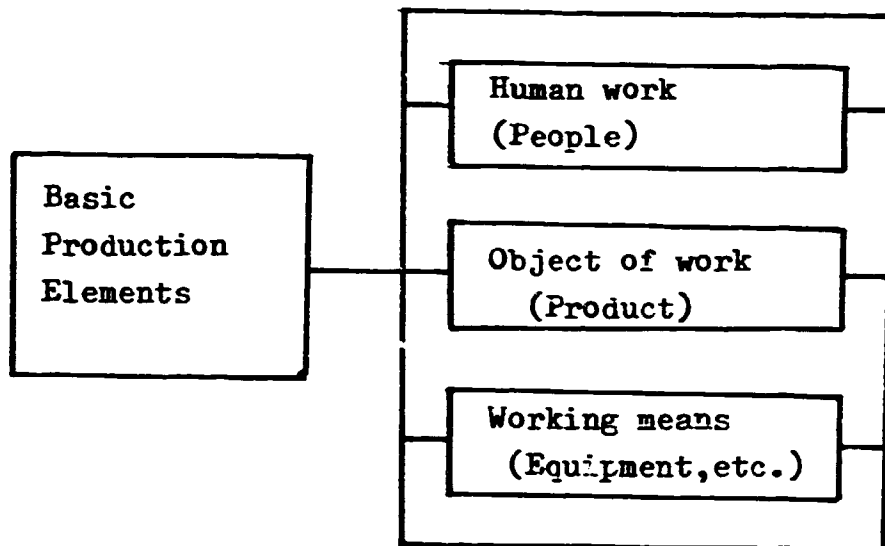


Fig. 3 Basic production elements.

The manufacturing process has the following seven elementary:

1. Production work in the workplace.
2. Quality control.
3. Internal transport.
4. Storage.
5. Protection of workers against injuries and occupational diseases.
6. Preventive maintenance of production means.
7. Supply of energy, water, steam, compressed air, etc.

The part of the production process related to point 1 above - the process of transforming a material into a product - is a technological process. Each technological process can be broken down into smaller technologically and organizationally complete entities, such as: action, operation, grip, move and micromove.

There are various levels of organization, depending on the size and complexity of a unit to be organized. In this case, two levels of organization will be considered:

1. Organization at the factory level, and
2. Organization at the level of the work area.

The structure of a factory's organization is predetermined by the type of product line and by the type of production. Basically, the product line consists of case furniture products designed as a modular system with interchangeable parts. The management of such a production and the issuance of production orders are directed in accordance to the market's demand. To conform production to the market demand means taking decisions ranging from storing finished products backwards to the production, i.e. sucking instead

of pushing production. It is the serial production of a medium size series of single parts. The size of a series is determined as an economically optimal number of parts derived from an average demand, production costs and storage expenses.

In order to produce along the lines described above, the factory should be divided into four departments, as follows:

- Cutting department.
- Machining department.
- Finishing department, and
- Assembling department.

Each department has its own stock of parts ready for delivery to the net department. When the quantity of any part falls below the established minimum, a production order for a new series will be issued. The procedure is similar with finished products, in the storage of finished goods or with materials in the supply storage.

When the Sales Department receives a purchase order, the inventory of finished products is checked and if the product required exists in stock a shipping order will be issued. If the product is out of stock, the sales department will, through the technical department, request the assembly of the required number of pieces of the product purchased by the customer. The production department (operational work preparation) will check the inventory of finished parts and, provided there is a sufficient supply, will issue the order for the required product. The same sequence of action will be followed till the cutting department. In case no raw material is available in the supply storage, the production department will send a requisition to the purchase department requesting the provision of the material needed. The purchase department will take immediate action in order to purchase the materials to be delivered to the supply storage.

This is an optimal cybernetic model easily applicable to computer data processing. Based on this approach and on the relevant design of technology, an organizational chart of the factory can be drawn.

The next subject is organizing the work area level. The work area is a basic organizational unit performing a part of the technological process. This area consists of five technologically and organizationally connected and interrelated factors, which are:

1. The product, a starting factor which the work area is created for.
2. The job to be performed, which is defined as a part of the whole process to be carried out in the work area. This is complete if the following elements are defined: the work order, the material, the tools to be used, the documentation required.
3. The production means, consisting of the machines, the fixtures and the installations.
4. The room, which should be of adequate size, form, microclimate and have adequate psychological conditions. The size of the work area required should be given in square meters and in volume. The microclimate, as an element of the work area, is rather complex and is determined by various parameters, such as: air temperature (should be around 20°C), air humidity (should be 70 percent), air circulation (should be 0.1

- m/sec.), illumination (should be 60 to 1500 lux), noise (should be below 80 dB), vibration, cleanliness.
5. Man, as the most important factor unifying and coordinating all other factors. He should have adequate knowledge, skill, physiological abilities, psychological characteristics, etc. (see Fig. 4).

The organization of the work area reflects everything that is good or bad in a factory. There are three basic types of working places, open, closed or stabilized work places. In the open work place the operator must stop production very often in order to request instructions or to bring materials, tools, etc. It is the worst organization with the lowest productivity.

The closed work place has a high level organization. The worker does not need to leave his work place, because everything is prepared for him (instructions, materials, tools, fixtures etc.), and productivity is therefore very high.

The highest organizational level has a stabilized work place which is basically closed, but all elements and performing methods are carefully studied, analyzed, optimized and standardized. It is the most efficient, and, for the workers, the safest and most comfortable work place.

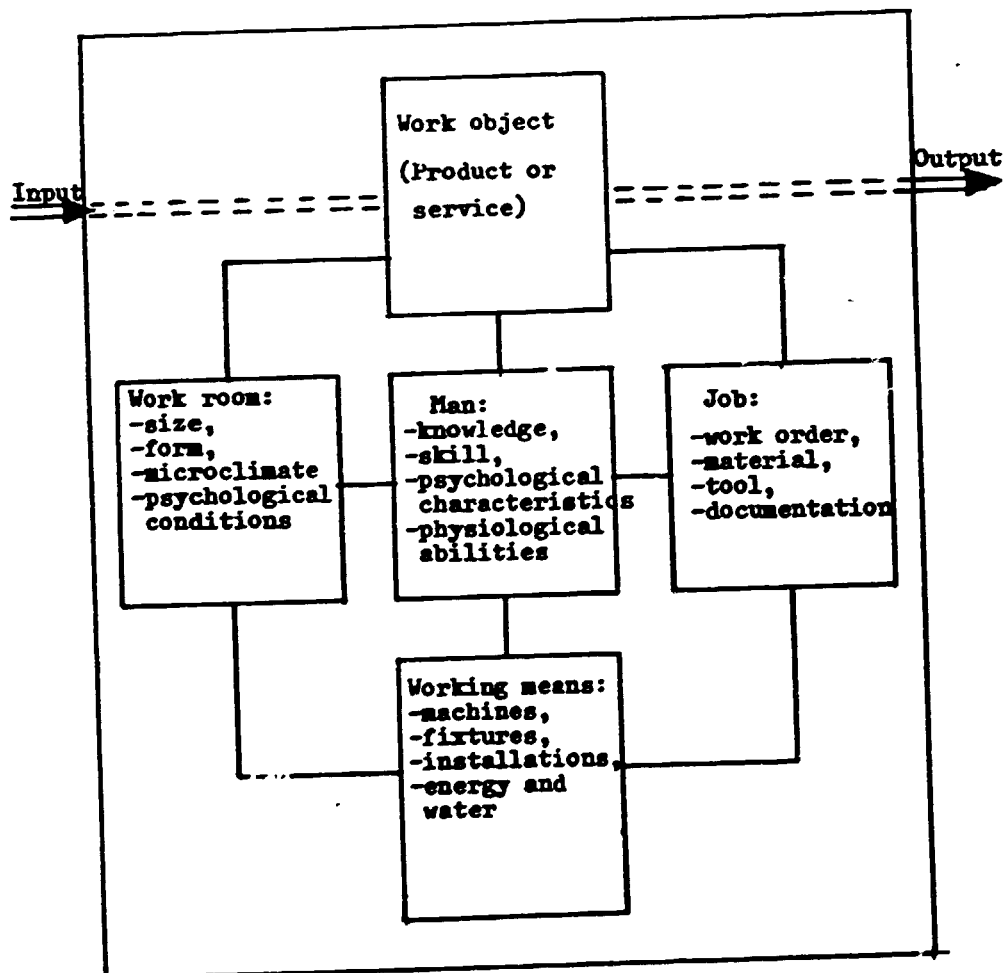


Fig. 4: Work area with determining factors and their interrelationship.

The closing of work places is an organizational decision, which must be designed and implemented in accordance with optimal conditions for safe, comfortable and high productivity work to be performed. The symbols for open, closed and stabilized work places are shown in Fig. 5 hereunder.

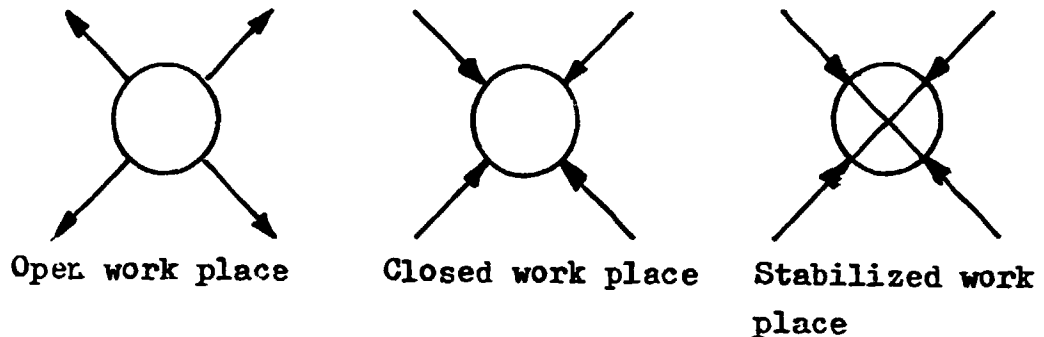


Fig. 5: Symbols for open, closed and stabilized work places.

#### 4. Purpose and organization of work preparation.

Work preparation is an indispensable part of modern industrial production. Basically, through work preparation, all elements which are necessary for the closed work place level of production are prepared. The most important tasks of work preparation are to:

- calculate the optimal size of series for each product;
- calculate loading of capacities to be used for each series;
- set operational times and calculate the number of workers for each series;
- calculate all materials needed for each product and the production series;
- allocate the optimal work distribution
- determine the optimal sequence of technological operations;
- set the time plan for production and dispatch work orders;
- provide work places with jobs (work orders, materials, tools, jigs, documentation);
- study, measure, improve and humanize work in the work places;
- organize all the production's elementary processes;
- analyze the data of the previous production in order to keep the level of utilization of capacities and materials under control and to improve existing standards.

The work preparation unit is divided into two major sections, usually called the technological work preparation and the operational work preparation. The task of the technological work preparation section is to prepare all the data and standards for one unit of each product. This comprises the construction of a product, detailed drawings, specification of

materials, operational lists and operational times, the production cost calculation and all other information needed for the production. This section must organize and maintain a data base for the standard product line. It is in charge of studying, analyzing and improving production methods and products. It works closely with both the designers and the operational work preparation section.

The task of the operation work preparation section is to prepare all the production documents for one series. It uses data prepared by the technological work preparation section and multiplies it by the number of units in the series. Work orders, loading of capacities, sequence of technological operations, time plan (schedule) and provision of documentation, materials and tools etc. concern this section. In order to avoid discrepancies between the two work preparation sections, it is best if they are part of the same unit, both under the control of the same chief. Figure 6 below shows a scheme for a work preparation unit with the duties of the two sections, which could be a good guide to show how the unit's work is organized.

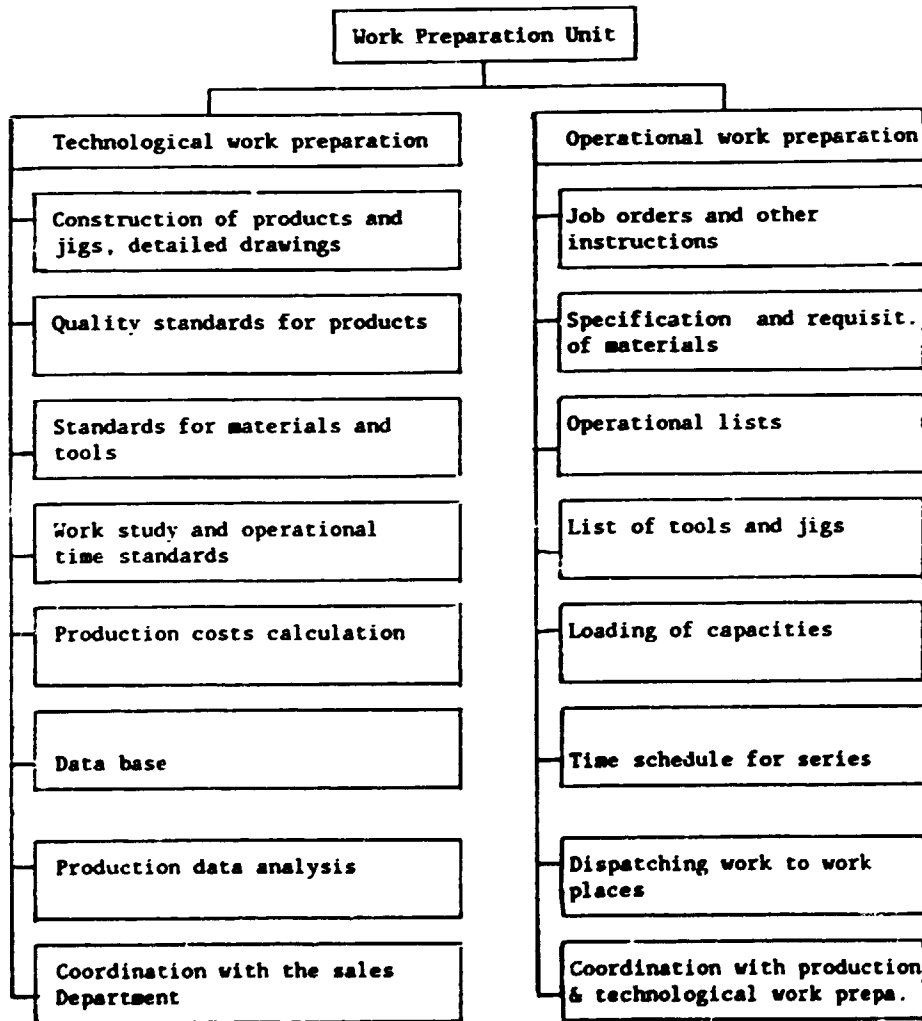


Fig. 6: Scheme of the work preparation unit's duties.

The number of employees in the work preparation unit depends on the level of standardization, on the type of production and on the equipment available. Since the P'vongvang Wood Processing Complex has a centralized work preparation for all its factories, the organization of that unit will not be considered here. Six people would be enough for the Pilot Furniture Plant, three for the technological and three for the operational work preparation. If the work preparation is done correctly, the production will go smoothly and free of the many obstacles usually found in an unprepared production process.

#### 5. Data base: its preparation and maintenance.

A data base consists of systematically prepared and coded data, stored for use as the standard information for repetitive processes.

In furniture production, the data base is related to the most important routine information about products, constructions, materials, capacities, tools, jigs, technological operations, operational times and labour. Once prepared, this data can be used at any point in time. The data compiled is subject to change each time the methods are improved, when they significantly deviate from the real production figures, or when other changes occur. The following set of data can be recommended for a data base in the Pilot Furniture Plant.

- **Data for products:** Name, code, description, design drawings, construction drawings, detailed drawings, price.
- **Data on construction:** Name of joints, code, dimensioned drawings, applicability.
- **Data on materials:** Name, code dimensions, quality, supplier(s), price.
- **Data on capacities:** Name, code, operations, capacities for each operation, limitations, specific alternative possibilities.
- **Data on tools:** Name, code, size, supplier, supplier's identification number or name, usage (machine and operations).
- **Data on jigs:** Name, code, drawing, usage (machine and operation).
- **Data on technology (operating methods):** Operational lists for all parts based on 100 units, code.
- **Data on operating times:** Name of operation, work place, time standard, number of workers.
- **Data on labour:** Name, code, sex, age, education, specialization, level of skills, work place.

## 6. Preparation of the production documents.

Production documents are used to convey written or drawn information through different levels, departments and work places. They contain orders, instructions, receipts, reports etc. Various forms are designed to be filled with a certain set of data/information and despatched to those in need of the information. The forms give directions on how to fill them. Sometimes, the same data should be written in various documents and despatched to various users. It is therefore recommended to design the forms in such a way that the same data is always written in the same place on the paper.

All personnel issuing or using production documents must understand and know how to use and handle them. The most important and most often used documents are: sales orders, detailed drawings, job orders, invoices, specification of materials, purchase orders, delivery receipts, material requisitions, issuance slips, cutting lists, transfer tickets, labour tickets, daily production reports, operation lists, quality control reports etc. They must be standardized and coded. All production documents must be carefully and thoroughly studied before proceeding with the prescribed activities, and analyzed after the activities have been completed and the actual data registered.

An open production system cannot be successful. To get a closed production system calls for the establishment of a feed-back loop control to follow up the process and to control deviations. For that purpose, all production documents must be completed correctly and promptly.

Documentation and feed-back systems are process control factors. At the same time, they are process improvement factors, because data recorded in the production process, sent back to the work preparation unit and carefully analyzed give new ideas and new arguments on how to reduce waste, how to increase productivity and quality of products, how to reduce production costs etc. This data is regularly used to rectify the data base when production figures differ from it significantly.

Information which is completed correctly and on time contributes to the efficiency of the communication and decision taking systems.

To ensure an efficient processing of the production information, a circulation scheme should be prepared for all documents showing: number of copies, their distribution and what action should be taken by those receiving the documents. Usually, these actions are worded as follows: issuance, control, to be informed, evidence, analysis and filing. Proper preparation and processing of information is the best guidance in any production system.

## 7. Job order and other relevant documents.

The job order is the only document authorizing the start of production. It contains all the major information (product, customer, delivery instructions, quality requirements, price, quantity etc.). The job order must be related to the sales order, and a master control listing should be maintained to keep track of job order numbers. The job order can be prepared as follows:



- Control number, the same as in the master control listing.
- Customer, for whom the product is being manufactured.
- Address of the customer and place where the products are to be delivered.
- Quantity.
- Quality requirements.
- Units of measure, such as: pieces, sets, etc.
- Price.
- Description: full name of products, model number, dimensions, materials, colour, finish, packing method, assembled or knock-down etc.
- Estimated starting date of production.
- Estimated completion date.
- Delivery schedule.
- Sales order number.
- Prepared by and date.
- Approved by and date.

Copies of the approved job order are distributed to the production, materials control, quality control, accounting and sales departments. All other necessary documents are completed and attached to the job order. An example of a job order is given in Fig. 7 on page 15.

The other relevant documents for production are prepared according to standard forms and for production, generated by the job order. The job order and the required set of documents must be completed for each series.

#### 8. Improvement of production and time standards.

Nothing is so good that it could not be improved. This well known statement means that production methods can be improved. The overall objectives of improving methods of production are increased productivity and lower operating costs. The degree to which these are met will depend on whether the objectives listed hereunder are met.

1. Reduced handling time of equipment, tools and materials.
2. Elimination of all unnecessary or nonessential activities.
3. Decreased time needed for completion of an operational activity.
4. Elimination of duplication of effort.
5. Safer and less fatiguing work.
6. Elimination of time, energy and materials waste.
7. Faster deliveries to the customers.
8. Decreased clerical and paper work.

Idle time and job delays lower productivity. Waiting for materials, tools and equipment raises questions. Why wait? Can the existing method be changed to reduce waiting time? A method analyst who attempts to identify flow processes to see if there is a smooth flow of material should identify weaknesses. Bottlenecks create another obstacle in the improvement of productivity.

Productivity should be improved on those jobs with the greatest repetitive volume. Any savings in time, cost or material in an operation which is repeated several times a day, will, when added up, amount to large overall savings during the course of a year. Work improvement must be formalized since it requires a series of techniques and procedures as well as a philosophy of work. It starts with investigating and analyzing the existing methods. The time and motion study technique is the main tool of a work analyst. Using adequate analytical methods, the method analyst discovers unnecessary losses and suggests new methods. The method improvement analysis compares old with new method values when it is complete and installed. It is advisable to set up the analysis in logical steps using an adequate form.

Several techniques are available to assist the analyst in collecting information to make his proposal for method improvement, such as: process analysis, system flow chart, work simplification etc. Each of these methods require specially trained professionals. The operational time standards should always be the results and by-products of the method improvement analysis, but not the result of a simple recording of operational times of the existing production methods.

JOB ORDER No. _____ / _____			
Production unit:			
Customer (name and address):			
Quantity	Unit	Description of product(s)	
<u>Type of material to be used</u>			
<u>Type of finish</u>			
<u>Packaging</u>			
Special instruction:			
Estimated starting date	Estimated completion date	Delivery schedule	
Copy distribution -Production -Material's control -Technical dept -Accounting	Refer to sales order number	Prepared by:  _____ Date _____	Approved by:  _____ Date _____

Fig. 7: Job order

## ANNEX I

## TRAINING PROGRAMME FOR FURNITURE MANUFACTURING

## 1. Introduction

This training programme is designed to accomplish the objective and outputs foreseen in the project "Assistance in the Establishment of a Pilot Furniture Plant" (DP/DRK/86/011).

Referring to the project document, the immediate objective is to "train wood technicians and machine operators in the efficient operation of all the machinery and maintenance of tools, so as to manufacture furniture of medium quality", and also to "train managerial staff in overall management techniques including introduction to the marketing of furniture products".

This objective will be achieved through the accomplishment of outputs Nos. 6, 8 and 10.

Output No. 6 states: "20 wood machinists, 10 assemblers and four team leaders trained in the efficient use of the available manufacturing equipment, able to manufacture furniture of medium quality acceptable for export."

Output No. 8 states: "Two wood technicians trained to design and make the required production fixtures aimed at attaining accurate machining of components parts."

And output No. 10 states: "Design of overall factory organization, with established work preparation, cost accounting and management procedures, with managerial staff trained in (a) factory management based on modern industrial production methods and in (b) the basic elements of marketing."

The planned activities of the quoted outputs are:

For output No. 6:

- 6.1 Prepare a training programme for furniture manufacturing.
- 6.2 Prepare a training manual for each of the major production operations.
- 6.3 Train 20 machine operators, 10 assemblers and four team leaders to manufacture furniture of acceptable quality.

For output No. 8:

- 8.1 Train two wood technicians to design, produce and maintain jigs and other furniture production fixtures.

For output No. 10:

- 10.3 Train factory management in modern industrial production methods.
- 10.4 Acquaint the managerial staff with the basic elements of export marketing.

Training labourers is an integral part of production in modern industrial enterprises. Technical and technological developments are offering, practically on a daily basis new products and methods which make human work easier, safer and more productive. To follow such advances, people working in industry have to learn and to train in order to acquire new

knowledge and skills necessary for the handling of modern equipment and processes.

In developing countries, such training has a decisive importance for the fuller utilization of new production techniques and for mastering new technological processes. To avoid unnecessary mistakes and to gain indispensable skills, training courses are the most rational mode, because people can learn, in a short time, the best ways of performing their production duties.

## 2. Training programme for the Pilot Furniture Plant

This training programme is designed to meet the specific requirements of the Pilot Furniture Plant. The main topics covered in the programme are:

1. Wood, affiliated products and other materials used in the production of case furniture:
2. Furniture products: design, construction and quality standards:
3. Production organization and work preparation:
4. Panel sizing:
5. Veneer trimming and joining:
6. Veneering:
7. Processing of veneered furniture parts: trimming, tenoning edge banding and drilling:
8. Moulding and routing:
9. Sanding:
10. Finishing:
11. Preassembling, assembling and packaging:
12. Tools, jigs and measuring instruments:
13. Quality control:
14. Safety measures in the furniture production:
15. Management based on modern industrial production methods:
16. Basic elements of marketing.

The main goals of this training are to enable workers, not only to learn how to perform their jobs, but also to understand the industrial production system as a whole.

Courses numbers 1, 2, 3, 12, 13 and 14 are foreseen to be attended by all workers to be trained, while the other courses are intended only for the workers who will perform the respective production operations.

All these courses are independent from one another, but in their totality they represent an integral training programme for the production of casegoods furniture in a medium size factory.

## 3. Methodology of training

There is an old Chinese wisdom which says "What I hear I will forget, what I see I will remember, and what I have done I will know." The output of this training should be knowledge learned by workers who will increase their ability for effective production. To achieve this, the training method will rest on three steps as follows:

1. Explain (to hear).
2. Demonstrate (to see). and
3. Try (to do).

Short manuals, written in a simple language, understandable to the workers, will be prepared for each course, translated into Korean and distributed to the trainees. All graphs, tables and formulae will be adjusted to the level of understanding of the people to be trained.

Theoretical teaching will take place in a classroom and its duration will be adapted to the minimum of theory which has to be known for a certain job. This part of the teaching will be performed by the expert (CTA) and the Chief of the Technical Department in the Pyongyang Wood Processing Complex (PWPC).

The practical part of the training will be organized at work areas for the respective work operations. For that purpose, the work areas must be organized correctly, including production documents, materials, tools, jigs, gauges, pallets, protective devices and everything that is necessary for productive, safe and good quality work. The expert will explain and show how to check a machine, tools, jigs and, in the case of wrong adjustments, how to correct them and prepare the equipment for correct use. The expert will show the correct way of performing operations and continue to supervise these operations until he concludes that proper work is fully accepted and that the quality of production is satisfactory.

The Chief of the Technical Department and other engineers who have undertaken training abroad will also collaborate in performing this practical training. Some practical experience of the trainees will help in the practical part of training.

Course No. 12 (tools, jigs and measuring instruments) should be conducted by the Tool Maintenance Expert.

Course No. 13 (Quality control). The manual prepared during the CTA's first mission can be used.

Courses Nos. 15 and 16 ("Management based on the modern industrial production methods" and "Basic elements of marketing") are foreseen for the managerial staff and will be conducted in a way to initiate discussion and an active participation of the trainees.

#### 4. Selection of trainees

The persons to be trained will be selected by the counterpart, according to their duties and to the topics of the training programme. Besides workers who will directly perform particular production operations, all other people concerned with certain aspects of the production, such as foremen, members of the management, maintenance personnel etc. could be included in the training.

It is recommended that in selecting the trainees attention should be paid that their physical and psychological abilities be in accordance with the requirements of the pertinent jobs.

The list of trainees is an integral part of the training programme, and it determines the number of copies of the training manuals to be prepared and distributed for every course.

### 5. Training programme

TITLE	TRAINING HOURS	
	Theoretical	Practical
1. Wood, affiliated products and other materials used in the production of case furniture	4.5	1.25
2. Furniture products: design, construction and quality standards	2.75	0.5
3. Production organization and work preparation	4.75	2
4. Panel sizing operation	2.75	3.5
5. Veneer trimming and joining	2.75	4.5
6. Veneering	5	4.5
7. Processing of veneered furniture parts: trimming, tenoning, edge banding and drilling	4.5	9.25
8. Moulding and routing	2.75	4.75
9. Sanding	0.25	4.75
10. Finishing	4.25	6.75
11. Preassembling, assembling and packaging	4.5	8.5
12. Tools, jigs and measuring instruments	5.75	4
13. Quality control	5	2.5
14. Safety measures and work protection in the furniture industry	5.5	1.25
15. Management of production in a modern industrial factory	10.25	-
16. Basic elements of marketing	5.25	-
GRAND TOTAL	70.50	62.00

Detailed syllabi for each topic are given in Annex IV.

## ANNEX II

DETAILED SYLLABI FOR THE TOPIC OF THE PROPOSED  
TRAINING COURSE

**Topic 3: Organization of production and work preparation.**

ITEM	TOPICS	TRAINING TIME (in hours)		LEVEL OF COMPETENCE TO BE REACHED
		Theoretical	Practical	
3.1	Introduction	0.25	--	Understanding the purpose of the course.
3.2	Types of furniture production	0.5	--	Knowledge about types of furniture production and their basic characteristics.
3.3	Production system, its establishment and maintenance	0.5	--	General understanding of a production system and its elements.
3.4	Organization of production for manufacturing case furniture	0.5	1	Understanding the organization system of the Pilot Furniture Plant.
3.5	Purpose and organization of work preparation.	0.5	--	Knowledge of work preparation tasks and procedures, as well as the work preparation micro-organization.
3.6	Data base, its preparation and maintenance	0.5	--	Understanding elementary facts about the data base and its role.
3.7	Preparation of production documents, use of documents in production and processing of information	0.5	--	Knowledge of production documents, type of documents, their function and the procedures they are subjected to.
3.8	Job order and other relevant documents reaching the work place	0.5	--	Ability to understand and use all documents sent to the work places, such as orders or instructions.
3.9	Improvement of production methods and time standards	1	1	Understanding the relations between improvement of production methods and operational time standards.
TOTAL		4.75	2.0	